N.A.C.A. BULLETIN

VOL. XXXVII No. 12 AUGUST, 1956

Trained Personnel: Key to Better Data Processing

by J. F. SUMMERS

Electronic Data Processing Supervisor, The Texas Company, Houston, Texas

It is becoming an increasingly mentioned point of emphasis that pre-preparation of accounting systems, careful selection of equipment, thoughtful development of computer routines, watchful refinement and adaptation of instructions, vigorous testing of results, and judicious expansion of the usefulness of installations are all involved in integrated data processing and the use of electronic equipment. These considerations are matters of manpower, in its highest terms as brainpower, and foresight. To this type of need, the present article is addressed.

IN SPITE OF THE POPULARITY of electronic equipment as a topic, most of the substantial information on the subject is still unpublished, simply because the men qualified to write upon it—i.e. those engaged in systems surveys, data processing analysis, and procedures development—are so involved in the surge of progress in this field that they have little time to set down their findings and case histories in publishable form. Also the magnitude of the subject defies presentation in a single paper. For this discussion, the following points are recognized:

1. That this is but one of numerous papers on the subject, each with its own useful emphasis, which are currently being offered to readers.
2. That punched-card electric accounting machine systems—and the importance of these machines in industrial accounting—is familiar ground.
3. That the fantastic speeds and capacities of data processing and computing equipment now and of the future have already been held up to dazzle all who are readers of this article.
4. That there is general knowledge of the basic elements of data processing as consisting of the preparation of source data, input of data into the system, the internal arithmetical and logical processing of the data, and the output of results.

A New Field of Endeavor

The emphasis of this presentation is upon people. The automatic features of electronic data processing, although they constitute marvels, can be overemphasized from a practical point of view. Some explanations are entirely too fast to get the truth across. Popular and quite effective in visual training aids is to depict the scheme of data processing as being like the use of an adding machine: the source of information is the column of numbers to be added, the input mechanism consists of a human being and the adding machine keys, the internal processing consists of the mechanism, and the output is the adding machine tape. This is a helpful analogy but, all too often, in such a presentation there is a quick (almost legerdemain) transition from this simple analogy to the fantastic computing capabilities and the wondrous end-results of this amazing new thing called electronic data processing.

In such manner of presenting the story of data processing, the plan is left out. These machines do not work by themselves nor can they think. The machines can do nothing to solve a problem or produce any work, until human beings define the problem or work to be done, analyze it, and tell the machine in most minute detail exactly what to do. The real story of data processing is about the vision, training, hard work, courage and enthusiasm of the people who make the decisions to try the new concept and the people who develop methods, procedures and systems and make them work. This article will be concerned mainly with these people. What should their qualifications be and what are some of their accomplishments and problems?

The systems man does not fit any long-established classical category of professional identification or is he, in my view, a specialist. His interests, experience and training must be quite general, and cover a wide variety of fields. Professor Norbert Wiener of M. I. T., himself a generalist in the mathematical and scientific fields and a pioneer in the general field of information theory, automation, and communications, wrote in his now famous book on cybernetics, that the most fruitful areas of growth of the sciences were those which had been neglected as a no-man's land between various established fields. It is these boundary regions of science which offer the richest opportunities to the qualified investigator. In this age of specialists, it may seem heretical to discuss a new profession admittedly general in nature. But it is abundantly clear that no one of the established fields associated with data processing and computing—accounting, mathematics, statistics, engineering—can alone supply the framework of the profession of machine data processing and computing. There must be another integrating force in the integration of data processing.

The scope of machine data processing is exemplified in the petroleum industry by the wide variety of problems suitable for machine handling. In exploration and production alone, there are countless data handling problems in accounting, economics, gas engineering, geology, geophysics, land and lease administration, petroleum engineering and research. In some companies, all of these problems are being considered for handling in the same machine installation, while, in other companies, separate installations are provided for research on the one hand and for operating groups, including accounting, on the other. In either event, a large variety of problems must be handled in a single installation. This means that we have accounting systems men working in close coordination with other groups.

The same kind of thing is present in other industries. Data processing is common ground for a number of fields and also a field in itself. The working together of accounting personnel with research and still other technical groups has provided all groups with a mutually beneficial common ground of understanding heretofore not possible. The points of view of the groups provide a cross-fertilization of ideas. The accounting methods people contribute information on preparation of the form of input and output and the methods of data control. The research mathematicians point the way to the mathematical or scientific approach to accounting problems. Thus, the emerging data processing profession, particularly in the petroleum industry, seems now to have established a preemptive occupancy of one of the above mentioned no-man lands surrounded by three main established areas:

1. Production and operations.
2. Accounting and comptrollership
3. Engineering and research.

The interdependence of all these groups can be shown schematically by a set of overlapping circles (Exhibit 1), with those representing the three main areas centered at the vertices of an equilateral triangle and with data processing and computing represented as a circle described about the center of the whole configuration.

Finding Qualified Personnel Means Training Them

With this setting in mind, what are some of the professional qualifications of the methods, procedures and systems staff, looking towards maximum advances in data processing? The composite mind of the group must grasp the overall perspective of data processing and computing and, at the same time, direct attention to the detailed requirements of particular problems. Indi-

RELATIONSHIP OF DATA PROCESSING TO OTHER FIELDS

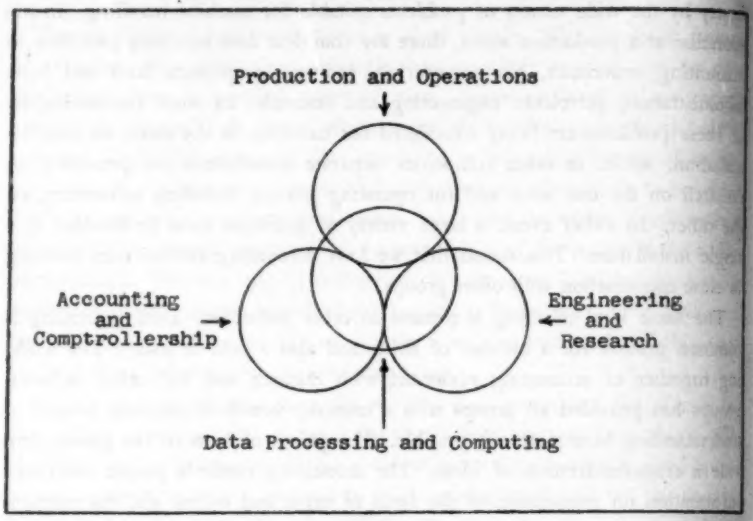


EXHIBIT 1

vidually and collectively, the members of the staff must be analytical, painstaking, alert, and inventive. They must have the mental disipline of rigorous mathematical thinking and again at the same time, possess the practical common sense of a business man. They must possess the character, stamina, and perseverence of a frontierman, and yet recognize that they are developing their new profession in an environment of already established professional practices, ethics, and social order. This imposes an additional important qualification, that of diplomacy and skill in working with associates in many areas of activities, in many departments, and at all levels of management and supervision.

But this is all quite general. What, specifically, do men on a methods, procedures and systems staff have to know in the current situation? Of first importance, they must know their business. In petroleum production accounting, they must have both extensive and detailed experience in oil and gas production accounting methods. Second, they must know the machines and equipment they have to work with, their capacities and speeds, and how to use them. Third, they must know how to apply these machines to their problems and procedures. This involves the analysis of complex data processing situations and reducing them to simple step-by-step sequential operations, flow charting, programming, testing, and production-line application of the procedure.

The next question is: where do we find men who know and can do these things? The fact of the matter is that such people are just not available in large numbers at the present time. For the most part, the qualifications must be developed in individuals through a comprehensive program of education, training, and study. The responsibility for this enormous and costly education program is now being shared by companies using or planning to use the equipment, the machine manufacturers, public accounting and management consulting firms, and universities. A company seriously involved in any data processing program will have need to tap at least one, and possibly all, of these areas of education.

The importance of the company's own training program cannot be over emphasized. Stream-lined laboratory-type courses sharply focused on the company's own applications can be given properly only in an intracompany training program. Specific detailed training should be given, not only to people involved in machine procedure development, programming, and the operation of the installation but also to other groups, i.e., who prepare source material for processing or who use the end results. It should be pointed out that organizing and carrying out a substantial training program is, in itself, an expensive and formidable undertaking. Effective sources of information include:

1. Services of systems personnel and technical representatives of the machine manufacturer.
2. Professional services in this field of the public accounting and management consulting firms.
3. Professional associations such as the National Machine Accountants Association and the Association for Computing Machinery (which are specifically concerned with machine data processing and computing), The Systems and Procedures Association of America, The American Petroleum Institute, which has a special study group on the subject, and, of course, educational and professional societies such as N.A.C.A.
4. Individual personal contacts and visitations to the machine installations of other companies. Highly valuable contacts can be made through the societies mentioned above.

There is still a different type of education needed—not well defined, like class-room and laboratory training—which is probably the most important of all. Its purpose is to create in the entire organization a climate which is favorable to carrying out the general program of the new concept of data processing. The programs of developing personnel, of strengthening the methods organization, and of conducting technical and general training is a continous task, to be carried on during the period of initial survey and investigation, during the progress of procedure development, during conversion to new systems, and afterward during the periods of critical evaluation and improvement.

A Work Program Within the Training Program

The work program and the training program for use of electronic equipment are often indistinguishable. Quite commonly, decisions are made to enter the automatic data processing field in a step-wise manner, first utilizing the smaller and intermediate machines and, finally, where economically justified, graduating to large-scale electronic computing systems. The training aspect is fundamental in such decisions. In order to make a specific analysis of the work program, let us assume for the moment that it and the training and personnel development program are separable. Then let us take a sweeping panoramic and macroscopic view of the steps to be performed in the overall program of work leading to, and beginning the actual development of, systems and procedures for machine data processing and computing. Briefly stated, we must:

1. Eliminate needless forms and procedures and streamline and simplify the handling of such forms and procedures as may be essential, in preparation for easier adaptation to automatic machine methods.
2. Standardize procedures with respect to the different offices and departments which may be affected.
3. Prepare detailed written charts of accounts in the simplest possible arrangement, for ease of numerical codification, and adopt uniform codes.
4. Determine the most likely areas for improving accounting and mass handling by automatic machine methods.
5. Make a detailed survey study to determine the economic justification of machine applications and the most suitable type of equipment.
6. Define the problems and work to be handled on machines. Consider the overall picture without regard to departmental lines, in order to synthesize, or integrate, data processing to an optimal extent with the objective of taking advantage of all possible uses of a given set of data on a single throughput basis.
7. In the case of large-scale computer programming, consider all of the repetitive routines and make a one-time task of coding these as standard service routines.
8. Commence detailed development of procedures, prepare flow charts, and program the procedures.
9. Design the required forms.
10. Make initial test runs of procedures and correct errors.
11. Set up master files.
12. Complete general machine operating administrative plans to cover scheduling, control and dispatching.
13. Prepare methods and procedures manuals for all applications.
14. Carry to completion the plans and specifications for the physical installation of the equipment.
15. Make final tests on procedures and start production-line operations.

These fifteen points represent the fundamental steps called for. On each of these, a separate volume could be written. The total effort required to carry out the program must be measured in terms of hundreds of man-months.

Participating in an Era of Change

Carrying out the investigation and survey phases of the program requires an almost macroscopic examination of the details of all existing methods. The examination itself produces interesting effects, the nature of which may be made

clear by a parallel in nuclear physics. Heisenburg, a pioneer quantum theorist and Nobel prize winner, has pointed out that we can never really see an electron in action. If we had a super-giant microscope which would magnify an object a hundred billion times—enough to bring something the size of an electron within the range of human sight—we would find that the magnification alone would not be enough. There must be light on the subject. Moreover, a special kind of light is needed, because ordinary light and even X-rays have wave lengths too long to be reflected by a tiny electron. We would have to use gamma rays as our light source. But, regardless of the kind of light used, whether ordinary or special radiation, the electron would instantaneously be bombarded by it and blasted out of sight.

Critical examination of your business, brought about by the detailed surveys in preparation for the new concept in data processing, is somewhat similar to this. It represents a new kind of light, the gamma radiation of business information, so to speak, which has an immediate effect on existing systems even before mechanization or electronization takes place. Thus, what we might call beforehand saving resulting from streamlining work, elimating duplication in effort, and imposing good discipline, can more than offset the cost of the survey. Further, the analogy can be taken a long step further. The general use of the new concept which has made its appearance in data processing and computing, will constitute a new order of magnitude of the power of light upon, and in insight into, modern business enterprise. This means exciting changes for all of us in the profession of industrial accounting. We are today at the threshold of a new era in scientific business management and scientific industrial accounting.

A Data Processing Revolution in Department Store Sales Accounting

by AUGUST J. CARSON

Systems Specialist, Management Services Division, Ernst & Ernst, Los Angeles, Calif.

The use of a point-of-sale recording unit, which prepares a five-channel tape recording, to initiate the processing of data on the price ticket and sales slip, provides an example of integrated data processing at work in a department store, where tabulating equipment takes over for summarization and report preparation. This article is notable not only for the applicability in retail accounting but because it provides another example of how integrated data processing functions. Accountants in all fields may find here a means of adapting some equally basic operation.

DURING THE PAST SEVERAL YEARS, the accounting profession has experienced a considerable transition to automatic equipment for accomplishment of accounting functions. This transition has developed initially in particular industries and for particular phases of accounting procedures. Hence, it is natural that department and speciality stores which have always expended considerable clerical effort in the preparation of sales tickets, inventory control records and reports, sales analysis and other reports required for the day to day management of a concern, should find an application of automation in this area. A large Los Angeles department store has adopted automatic sales accounting through the use of point-of-sale recorders as a means of obtaining greater speed, accuracy and efficiency in its clerical functions. Here, then, is the story of such a system which may be the leader in the coming revolution in department store sales accounting.

Integration Begins in Receiving Room

The starting point in an automation of a sales accounting system is the receiving-marking rooms of the department store. Specially designed marking machines are used to punch minute holes in a three-part price ticket which is attached to each item of merchandise. The information so punched is also printed on the ticket for the information of sales personnel and customers. Exhibit 1 illustrates a price ticket punched and printed for the following information:

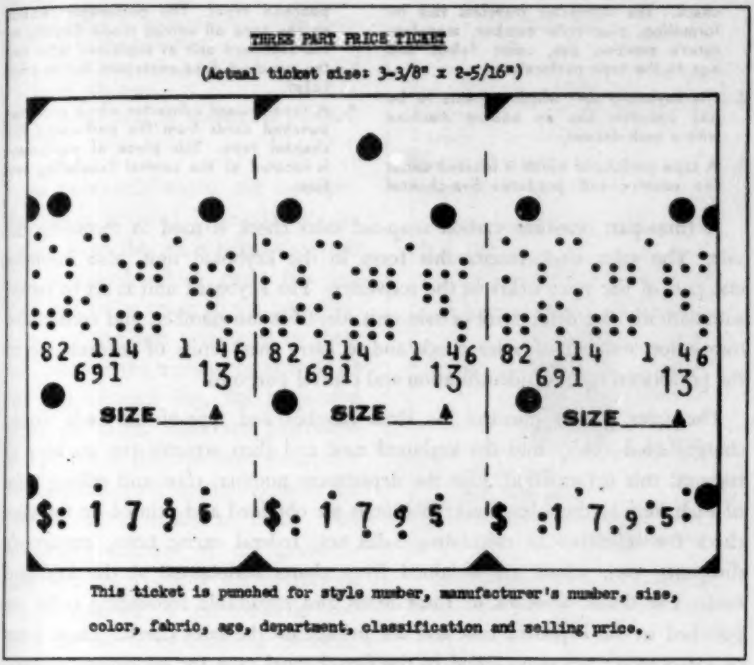

THREE PART PRICE TICKET
(Actual ticket size: 3-3/8" x 2-5/16")
82 114 1 46
691 13
SIZE A
$: 17.95
This ticket is punched for style number, manufacturer's number, size, color, fabric, age, department, classification and selling price.

EXHIBIT 1

Style number	Age
Manufacturer's number	Department
Size	Classification (or Section)
Color	Selling price
Fabric	

One part of the price ticket is used, if needed, for inventory or mark-down purposes, one part is removed from the article by the sales person for use at the point-of-sale recorder when the sale is registered and the third part of the price ticket always remains with the article for identification in the event the item is returned by the customer.

Three Point-of-Sale Units, Plus Central Tape-to-Card Converter

The point-of-sale recorder consists of four parts:

1. A price ticket converter device into which one part of the price tickets is inserted. This device automatically reads the perforated tickets and transfers, the price, department and classification to the keyboard for imprinting on the sales

check. The converter transfers this information, plus style number, manufacturer's number, size, color, fabric and age to the tape perforator.

2. The keyboard unit which appears to be and operates like an adding machine with a cash drawer.
3. A tape perforator which is located under the counter and produces five-channel punched tapes. The perforator records on the tape all entries made directly on the keyboard unit as explained later and the punched data contained in the price ticket.
4. A tape-to-card converter which produces punched cards from the perforated five channel tape. This piece of equipment is located at the central tabulating section.

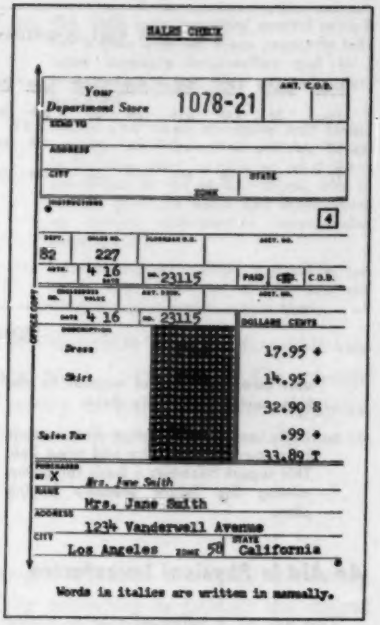
A three-part one-time carbon snap-out sales check is used in recording the sale. The sales clerk inserts this form in the keyboard unit, also inserting one part of the price ticket in the converter. The keyboard unit is set to record automatically the date, point-of-sale unit identification number, and consecutive transaction number of sales check and to carry these units of information to the perforated tape for identification and control purposes.

The sales person punches his clerk number and type-of-sale code (cash, charge, c.o.d., etc.) into the keyboard unit and then actuates the machine to transmit this information, plus the department number, class and selling price of each item to the sales check. Subtotals are obtained and printed on the sales check for reference in calculating sales tax, federal excise taxes, employee's discounts, etc., which are obtained from charts maintained at the keyboard unit. The dollar amounts of these items and applicable accounting codes are punched in the keyboard unit and are printed on the sales check. These items of information are also carried to the five-channel tape for subsequent processing. The keyboard unit has a sequence of lights which indicates to the sales clerk the entry to make and controls the operation to prevent entries being made in improper sequence.

The customer name and address are stamped on the sales check by "charga-plate" if available. If not, this information is written in manually. A brief description of each item sold such as "dress", "blouse", "shoes", etc., is written on the sales check to assist the customer in relating the prices appearing on the sales check to the items purchased. It is to be noted that most of the manual clerical effort has been eliminated, i. e., clerk number, type of sale, prices, extensions, service charges, taxes, employees' discounts, addition and subtraction. (One point-of-sale recorder may serve a number of departments. Consequently, a common cash drawer is used for all the transactions recorded at one equipment station. The cash deposit from this station is made by one person for transmittal to the general cashier).

Exhibit 2 illustrates the sales check used. Three copies are distributed as follows:

1. Office copy for sales audit and accounts receivable, to be sent with monthly statement to the customer.
2. Internal copy for check-up purposes and future reference.
3. Customer copy to accompany merchandise.


SALES CHECK

Your Department Store 1078-21

AMT. C.O.D.

SEND TO

ADDRESS

CITY STATE ZONE

INSTRUCTIONS

4

DEPT. 82 SALES NO. 227 SALESMAN'S O.K. ASST. NO.

DATE 4 16 NO. 23115 PAID CHG. C.O.D.

CHARGE ACCOUNT NO. NAME ASST. DEPT. ASST. NO.

DATE 4 16 NO. 23115

QUANTITY	DESCRIPTION	DOLLARS	CENTS
	Dress	17	95
	Shirt	14	95
		32	90
	Sales Tax		99
		33	89

PURCHASED BY X Mrs. Jane Smith

NAME Mrs. Jane Smith

ADDRESS 1234 Vanderveil Avenue

CITY Los Angeles ZONE 58 STATE California

Words in italics are written in manually.

EXHIBIT 2

As previously stated, the tape perforator is actuated by electronic impulses from the price ticket converter and keyboard, which cause the perforations to be made in the tape, representing the data originated by these two parts of the equipment system. At the end of each day, the perforated tapes are taken from the perforator and placed in the tape-to-card machine which produces tabulating cards at the rate of 6,000 cards an hour. The equipment number of the point-of-sale unit from which the perforated tape originated is punched on the cards for use in establishing the cash, charge, c.o.d., etc., accountability originating at each particular station.

Tabulation of Control and Analysis Reports

The punched cards produced as above are processed through standard tabulating machine methods to obtain tabulations of:

1. Control figures by point-of-sale recorder stations covering:
   a. Cash sales, which are balanced with cash deposited with the general cashier.
   b. Charge sales, which are balanced with totals shown by adding machine tapes to the charge sales checks.
   c. C.o.d. sales, which are balanced with totals shown by adding machine tapes of c.o.d. sales checks.
2. Sales analysis data covering:
   a. Daily sales by clerk, in dollars and number of transactions.
   b. Daily sales by departments and sections, in dollars and number of transactions.
   c. Taxes.
   d. Parcel post.
   e. Insurance.
   f. Employee discount.
   g. Other desired data.
3. Inventory control reports covering quantities sold:
   a. Daily unit inventory control data report by department and analyzed by store. This report (Exhibit 3) gives the buyer a quick review of the day's sales in terms of merchandise sold. It is also used for postings to the

DAILY UNIT INVENTORY CONTROL DATA REPORT

Dept.	Class	Mfr.	Style	Age	Color	Size	Price	Units	Total Sales	Units	Main Store	Units	Branch 1
17	32	110	115	26	43	140	39.95	1	39.95	1	39.95		
17	32	110	115	26	53	140	39.95	1	39.95			1	39.95
17	32	244	509	115	1	100	17.95	2	35.90	1	17.95	1	17.95
,	,	,	,	,	,	,	,	,	,	,	,	,	,
,	,	,	,	,	,	,	,	,	,	,	,	,	,
,	,	,	,	,	,	,	,	,	,	,	,	,	,
								41*	1,482.45*	25*	812.10*	16*	670.35*

EXHIBIT 3

unit inventory control records to obtain current inventory data.

b. Daily and weekly price line reports by department, by size and price line. This report becomes a basis for determining the future season's buying plan.

c. Daily or weekly "hot number" report (fast-moving styles from current purchases), by style number and manufacturer. This report furnishes the buyer with information regarding rapidly moving items and the need for further purchases.

An Aid in Physical Inventories

The use of a point-of-sale recorder system is of material assistance in taking and compiling physical inventories. The extra copy of the price ticket is removed from each article by the inventory team. The perforated price tickets are run through the converter to obtain a five-channel punched tape from which punched cards are obtained. Departmental inventories are tabulated for the buyers and are analyzed by age, style, manufacturer or other desired codes.

Benefits from New System

Based on the department store's experience to date, as stated by its treasurer, the benefits obtained from point of sale recorders may be summarized as follows:

1. Service has been vastly improved. Time studies show that the clerk time required after the customer says, "I'll take it" is cut in half.
2. An experienced clerk operating the point-of-sale keyboard at peak sales periods can prepare a sales check four times faster than a sales clerk preparing a handwritten sales check.
3. Training time is reduced substantially. Company experience has proven that considerably less break-in time is required to teach employees how to operate the point-of-sale recorder than to prepare sales checks manually operate cash registers and maintain required classification records.
4. Classification tally writing is eliminated.
5. Arithmetic and illegibility errors are eliminated, thus reducing billing adjustments.
6. Returns and merchandise adjusting claims are reduced, inasmuch as damage or soilage to goods is reduced a

sales clerks do not have to handle messy carbons.

7. Multiplication, subtraction and addition are done automatically on the machine.
8. Sales clerks spend more time in selling instead of bookkeeping.
9. Considerable clerical help is saved by taking the inventory with the price ticket converter.
10. Cash registers which have been replaced by the new equipment can be used in other departments to replace old registers or to meet the need of extra registers during seasonal peak periods.
11. The daily unit inventory control reports for buyers provide them promptly with more accurate information and in a form easier to use than any prior data furnished.
12. Faster and more complete unit inventory control information enables buyers to increase sales by knowing what items are selling at the several stores, and to reduce stock on hand and mark-downs by turning slow-moving merchandise more rapidly.
13. Inter-department selling is possible, because any clerk can go to any department and record a sale there.

The success of this installation has been materially aided by favorable customer and employee reaction to the magic word, "electronics". The inherent benefits from such a system have been readily recognized by sales employees, who have cooperated fully to make this pioneer system an outstanding success in department store sales accounting.

A Look Into the Future

With standard punched card accounting equipment, a number of sorting and tabulating machine operations must be performed to produce the desired sales analysis data. Consideration is being given to substituting a punched card electronic computer which, by one or two card passes, could produce at high speed the necessary data on summary cards, from which the various reports could be obtained on a tabulator. Consideration is also being given to a punched card electronic computer which can utilize the perforated tapes as the input medium. Such an installation would materially speed up the process of obtaining sales analysis and unit inventory control data. Also, a small electronic computer with sufficient memory devices would permit all data to be recorded from feeding the perforated tapes to the computer from which unit inventory records, reports for inventory control, sales analysis and accounting entries could be obtained.

Automation of accounting has been obtained in this system on all phases of sales recording except customers' accounts receivable, although the data required for this also is available with one exception—a customer's account number. Inasmuch as many department stores will use point-of-sale recorders in the near future, a question rises as to whether this number should, like the customer's name, be the same wherever he buys. A single "charga-plate" is usable now at many stores to obtain credit. The number would have to be common to all stores.

The logical method to obtain such a number would be through the local retail credit bureau by means of a new-type credit plate or card which would have the number punched in it for use in the price ticket converter at the time of sale. The account numbering system must necessarily be related to the alphabet in order that alphabetic-numeric sequence be automatically maintained, to eliminate cross reference files. As soon as a customer's account number can be punched into the tape by the tape perforator, complete automation of sales accounting will be a reality!

A Conversion to Punched Card Accounting

by THOMAS P. MORRIS

Manager, Accounting Department, Meredith Publishing Co., Des Moines, Iowa

This report of faster and fuller information obtained through a punched card accounting system, in place of bookkeeping machines and manual preparation of statements, suggests a solution to data processing improvement which may appeal in many situations, especially when the supplementary uses to which the equipment may be put, as identified in this article, are reviewed. The author has provided illustrations of the principal forms used.

FOLLOWING THE PRESENT DAY trend of modernizing and streamlining, the accountant should not overlook the potentials existing in the accounting department. This paper describes the experience of a major publishing house in converting to punched card accounting, although problems peculiar to our industry are not emphasized. Before the current system was installed, the records were maintained on a bookkeeping machine and all statements were prepared manually, but the growth of the company created a corresponding increase in the volume of accounting data, as well as an urgent need for more timely reports. We had either to search for a more efficient method of accounting or expand the department. In examining the possibility of using punched cards, we asked ourselves many questions such as:

1. Can the time necessary to closing each month be reduced?
2. Will departmental expense and performance statements be in the hands of department heads earlier?
3. Can additional information be provided to department heads to implement cost control?
4. Will cost of supplies for forms be increased substantially?
5. Will accuracy be impaired?
6. What new procedures will be required?
7. Will there be a monetary savings?

Each question was analyzed and every attempt was made to be fair in our assumptions. The first four questions, we determined, could be answered in the affirmative. After a thorough study, it was felt closing dates could be advanced. Also, department heads could be provided information not heretofore available—ledger control listings of individual accounts, manufacturing, research, and mechanical job order listings in support of summary entries to accounts, and lists of supplies issued from the stock rooms. This information would be available in a matter of hours, as compared to days if done manually.

Supplies definitely would cost more because of additional information and the increased use of carboned, pre-printed forms. As to the remaining questions, the sixth answered the fifth, as proper procedures would be written which would insure that books would balance on a daily basis. The seventh and last question was the most difficult to answer. A measurable monetary savings would occur by the transfer of one clerk to another section of the division but, in addition, intangible gains would be made through improved services to line departments.

Necessary Changes in Accounts and Procedures

The decision to change the method of accounting created many detailed problems. In our organization are fifty departments operating on a budget and fifteen departments operating on a standard cost system. First, our chart of departmental account numbers was revised. It was necessary to make the departmental expense accounts uniform and to set them up as shown in Exhibit 2. The balance sheet and operating series of account numbers are composed of two and three digits. For example, Account No. 10 is Cash in National Bank and Account No. 104 is Paper Inventory. Departmental expense accounts are composed of four digits. The first two indicate the department and the last two indicate the type of expense. For example, Account No. 8111 indicates the accounting department (81) and supplies (11).

In many of the departments we had to provide special accounts which pertain to distinct functions. It has been found advantageous to maintain our records so they may be summarized on a company-wide basis. We have eleven standard accounts which are common to all departments. Inasmuch as these accounts comprise a large portion of our departmental expense, they are highlighted in a special report to management each month. The numbers of these accounts are the same in each department and are as follows:

01. Payroll
07. Overtime
08. Social security
09. Telephone, telegraph, and express
11. Supplies
12. Work by other departments
13. Repairs and maintenance
14. Research
15. Sundry
16. Travel and entertainment
20. Obsolete material

Major and minor changes were also made in the general ledger series of accounts. It is now possible to pull all cards in the operating accounts, tabulate them and, in a matter of minutes, arrive at the earnings before taxes. Another change involved a method of handling our personal accounts receivable (travelers).

The next big step was a program of educating the department heads to our

new system. Each department head was furnished with a complete list and description of departmental account and expense numbers. We conferred with each one soliciting his help and, in turn, outlining how he would benefit from the punched card installation. The response was a complete success. Coordination between the accounting and tabulating departments was also required. One member of the accounting staff was designated for this liaison, an arrangement which works very satisfactorily. To further ensure that all schedules and deadlines are met, a meeting is held the last week in each month by the controller with all supervisors to discuss the monthly closing schedule. At this meeting, deadlines are set for each operation and the prior month's schedule is discussed.

Processing the Source Data

When designing our forms for voucher, journal entries and cash receipts, we set them up so the key punch operator could follow the same routine with each processing operation. This operator punches the description, reference number, source, date, account number (s), amounts and functional account number (described later). Since it is necessary to use vendor's invoices as vouchers, a stamp shown was designed to be placed on each invoice. This also provides for the uniform sequence of data.

The editorial content punched from the description space serves as information which goes on general ledgers and ledger control listings. The reference number is the number appearing on the voucher, invoice, journal entry, and cash receipt and serves the purpose of identification. The source code identifies the type of original document, creating a balancing medium. In the event that a punched card is lost, throwing the trial balance off, the area can be identified readily by sorting all entries by source code and balancing each category. When the source which is out of balance is located, it is balanced back to batch until the missing card is located. The card date corresponds with that on the original document and the entry date always refers to the month in which the item is to appear.

The Vouchers (Exhibit 1) are prepared throughout the plant and eventually find their way to the accounting department for payment. After payment, the invoices and vouchers are sorted by voucher number into batches of one hundred and forwarded, with a balancing adding machine tape, to the tabulating department where the information is punched into cards. Each account number is charged and the batch total is credited to accounts payable. The cards are verified, balanced, and a listing (Exhibit 2) is returned to the accounting department with the vouchers. The vouchers are then filed. After checks have been written for the

VOUCHER

Make Check Payable to _____

Date Submitted _____

EXPLANATION | AMOUNT | DELIVERY INSTRUCTIONS

☐ Mail Check

☐ Deliver to _____ Date _____

_____ Checks @ $ _____ Hold Cash $ _____

how many | how much each | for cashing check

Ordered by | Dept. Head | Controller | Acctg. O.K.

DESCRIPTION (To be filled in by Acctg.)

Reference Number _____ Source 4 Entry Date _____

Div. | Acct. No. | Job No. | Amount | Date Paid | Check Number | Inter-Co. Acct# | Vendor No.

8111

TOTAL

EXHIBIT 1

month in payment of the vouchers and invoices, a journal entry is prepared charging accounts payable and crediting discounts on purchases and cash.

Journal Entries (Exhibit 3) are prepared in the accounting department. They are numbered and sent with an adding machine tape to the tabulating department in batches of fifty. The information is punched into cards, verified, balanced, and returned to accounting with a listing (Exhibit 4.)

Work Cards (Exhibit 5) are made up in the standard cost departments by individuals performing productive work. The work card represents the time worked on the various operations and serves as the basis for payroll charges to job orders, and amount of credit for the standard cost departments. The name,

LEDGER CONTROL LISTING

Date Mo.	Day	Yr.	Reference	Source	Description	Account Number	Debits	Credits
12	31	55	30349	4	Chas. Kooser	231	5.00	
12	31	55	30350	4	Jesse Box Corp.	913	20.00	
12	31	55	30351	4	Marketing Assn.	6250	10.00	
12	31	55	30352	4	Lowe & Camp	9328	2.50	
12	31	55	30353	4	J. Walter	2041	500.00	
12	31	55	30354	4	Truck & Equip.	280	1.00	
12	31	55	30355	4	Steel Co.	280	25.00	
12	31	55	30356	4	Hickerson Inc.	5042	75.00	

Source Code: 1. Cash Receipts 2. Fixed Journal 3. Journal 4. Voucher

EXHIBIT 2

JOURNAL ENTRY

Reference No.

Description (in 25 spaces)_____ Source 3 Date / /

Div.	Account Name (Do not punch)	Account Number	Job Number	Amount Debit	Amount Credit	Inter-Co. Acct. No.
		8111				

Prepared by:_____
Approved by:_____ TOTALS

EXHIBIT 3

LEDGER CONTROL LISTING

Date Mo.	Day	Yr.	Reference	Source	Description	Account Number	Debits	Credits
12	31	55	4276	3	Billing 3 12	61	5.00	
12	31	55	4276	3	Billing 3 12	835		5.00
12	31	55	4278	3	Accrue Use Tax Dec. Pur.	893	100.00	
12	31	55	4278	3	Accrue Use Tax Dec. Pur.	544		100.00

Source Code: 1. Cash Receipts 2. Fixed Journal 3. Journal 4. Voucher

EXHIBIT 4

WORK CARD

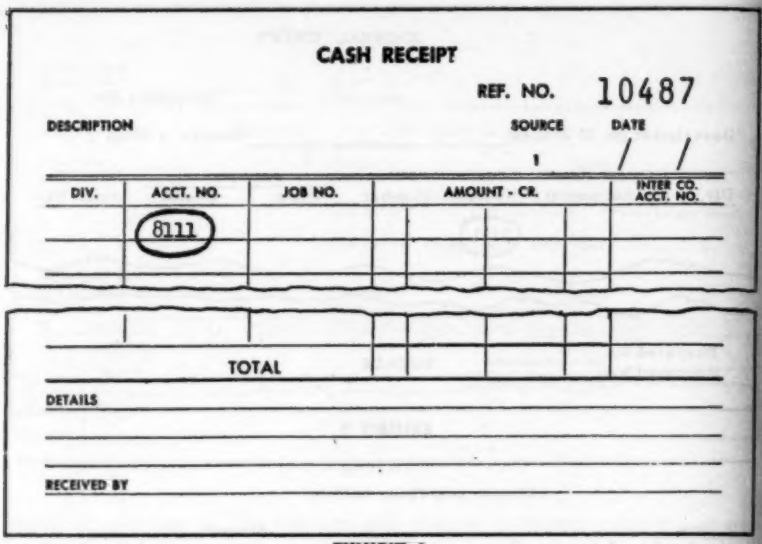
Name_____ Dept._____ Payroll No._____ EX-CL_____ Job Class_____

Job No:_____ Acct. No: 8211 Mach. No:_____ Magazine:_____ Issue:_____

Date and Time | Earnings | Oper. No:_____ | Delay (Rate Reason)

F Circle Time Meter F 0
Shift 1
S Worked S 2
E Reg. Hrs. E 3
F No Lunch Production 4
E DO NOT FOLD 8

EXHIBIT 5



CASH RECEIPT

REF. NO. 10487

DESCRIPTION | SOURCE 1 | DATE / /

DIV.	ACCT. NO.	JOB NO.	AMOUNT - CR.	INTER CO. ACCT. NO.
	8111			
	TOTAL			

DETAILS

RECEIVED BY

EXHIBIT 6

department, and payroll numbers are pre-printed. The worker fills in the job and operation number. The cards are checked in each department and then forwarded to the costing section where daily audits are made. This section also performs a weekly audit after the tabulating department runs a weekly summary of the daily total of each individual's work card. This summary is checked back to the clock cards.

The cashier receives all cash, checks, and money orders and records receipt of these on Cash Receipts (Exhibit 6). At the close of business each day, the cash receipts are totalled, checked against the money on hand, and become the control for the bank deposit. A recapitulated receipt provides the total debit to cash and the individual receipts become the offsetting credits. A listing (Exhibit 7) is returned to the accounting department.

Closing the Books and Issuing Monthly Statements

All the above-listed items must have the approval of the manager of the accounting department before they can be processed. They then go to one of the staff for final distributions and audits. At the end of the accounting month, when all vouchers, invoices, journal entries, and cash receipts have been processed by the tabulating department, a trial balance is sent to the accounting

LEDGER CONTROL LISTING

Date Mo.	Day	Yr.	Reference	Source	Description	Account Number	Debits	Credits
12	31	55	42	1	Bell Tel Company	9359		50.00
12	31	55	43	1	George George	231		10.00
12	31	55	44	1	KCMO	248		150.00
12	31	55	45	1	Railroad Company	5594		5.00
12	31	55	47	1	Railway Express Agency	5594		5.00
12	31	55	48	1	Railroad Company	5594		5.00

Source Code: 1. Cash Receipts 2. Fixed Journal 3. Journal 4. Voucher

EXHIBIT 7

department. After the expense accounts have been closed into the operating accounts the tabulating department furnishes the accounting department with a balance sheet. From this information, the regular monthly financial statements are prepared.

DEPARTMENTAL EXPENSE STATEMENT

93 PERSONNEL — DEC. 1955

	Account	This Month Budget	Actual	Over/Under (Cr)	Budget Change	Accumulative Budget	Actual	Over/Under (Cr)	Budget Change
1	Payroll	6,000	5,000	1,000CR		50,000	55,000	5,000	
4	Trainees Payroll	1,000	900	100CR		3,800	4,000	1,800	
5	Separation Pay	20	120	100		300	200	100CR	
6	Other Payroll	700	200	500CR		7,000	4,000	3,000CR	
7	Overtime		30	30			300	300	
8	Soc. Security	200	175	25CR		2,000	2,100	100	
	Sub Total	7,920	6,425	1,495CR		62,300	65,600	3,300	
9	Tel Tel & Express	50	40	10CR		300	290	10CR	
11	Supplies	150	200	50		1,000	1,100	100	
12	Work by Other Depts.	200	150	50CR		1,500	1,600	100	
13	Repairs & Maint	150	175	25		1,500	1,000	500CR	
15	Sundry	50	60	10		500	450	50CR	
16	Travel	250	550	300		4,000	4,500	500	
27	Outside Services	200	190	10CR		1,500	1,400	100CR	
28	Athletic Activities	100	90	10CR		3,000	3,100	100	
29	Medical	700	650	50CR		6,000	7,000	1,000	
30	Picnics & Parties		100	100		5,000	5,500	500	
32	Personnel Testing	150	140	10CR		1,000	800	100CR	
34	Plant Promotion	100	400	300		15,000	14,000	1,000CR	
35	Safety Promotion	700	900	200		6,000	4,000	2,000CR	
36	Advertising	800	200	600CR		4,000	4,500	500	
37	Parking Lot Exp.	800	800			5,500	5,500		
38	Union Negotiations	200	50	150CR		1,000	1,200	200	
39	Music	250	150	100CR		800	700	100CR	
40	Christmas Parties	75	70	5CR		15,000	16,000	1,000	
41	Retainer Fees	2,000	1,000	1,000CR		8,500	8,000	500CR	
43	Training Program	2,000	4,000	2,000	2,000	6,000	8,000	2,000	2,000
49	House Organ	1,000	1,100	100		6,000	6,500	500	
50	Dues	500	400	100CR		5,000	4,000	1,000CR	
51	Servicemens Exp.	50	60	10		500	450	50CR	
59	Telephone Rental	1,500	1,500			9,000	9,000		
88	Tab Department	100	80	20CR		600	650	50	
	Sub Total	12,075	13,055	980		108,200	109,340	1,140	
	TOTAL	19,995	19,480	515CR		170,500	174,940	4,440	
98	CONTRA.	500CR	500CR			3,000CR	3,000CR		
	Net Cost	19,495	18,980	515CR		167,500	171,940	4,440	
	Employee Count Exm. Excluding Part Time	20	18	2CR					

EXHIBIT 8

When the balance sheet has been prepared and forwarded to the accounting department, the tabulating department prepares the monthly departmental expense statements for each of the departments which are on a budget basis. These departmental expense statements (Exhibit 8) show the budget, actual, over and under, and budget changes for the month and year-to-date on each item charged to the department. The department head is also provided with the additional information listed below which supplies the detail of all charges appearing on the expense statements and the accounting department is then furnished with the ledger sheets also enumerated:

For Operating Departments

1. Ledger control listing (Exhibit 9)
2. Manufacturing Job Order Listing (Exhibit 10)
3. Mechanical Job Order Listing (Exhibit 11)
4. Listing of supplies requisitioned from Stock Room (Exhibit 12)

For Accounting Department

1. General Ledgers (Exhibit 13)
2. Expense Ledgers (Exhibit 14)
3. Personal Ledgers (Exhibit 15)

Some Detail Steps Behind the Results

The daily accounting work of the tabulating department starts with the cards punched from the source documents. Many other steps follow. These distribution cards serve as the basis for all reports and statements. Each batch of cards is listed on the accounting machine on a special report form for use as a daily ledger. This listing also serves as a balance to determine the accuracy of the punched cards. The cards are then filed for further processing. Each batch of documents contains one type of source information. At no time are

LEDGER CONTROL LISTING

Date Mo.	Day	Yr.	Reference	Source	Description	Account Number	Debits	Credits
12	31	55	4070	3	St. Time & Exec. Pr.	9301	5000.00	
12	31	55	4070	3	St. Time & Exec. Pr.	9304	900.00	
12	31	55	4071	3	General Payroll	9305	120.00	
12	31	55	4071	3	General Payroll	9306	200.00	
12	31	55	4074	3	Overtime Prem. Dec.	9307	30.00	
12	31	55	4145	3	SS & Unemp. Tax Accrual	9308	175.00	
12	17	55	12 0759	4	Bell Tel Co.	9309	20.00	
12	29	55	12 1880	4	Western Union	9309	20.00	
12	29	55	4004	3	Office Stock	9311	150.00	

Source Code: 1. Cash Receipts 2. Fixed Journal 3. Journal 4. Voucher

EXHIBIT 9

MANUFACTURING JOB ORDERS

Description	Acct. Charge	Job Number	Amount
Voucher Checks A	8111	8073	100.00
Office Stock Form 2662	8111	8075	20.00
Multilith Charges	8111	8080	10.00
			130.00

EXHIBIT 10

cash receipts mixed with vouchers or journals. The flow of the monthly accounting work of the tabulating department is more difficult to detail. This and following paragraphs give some idea of it. As soon as all of the vouchers, journals, and cash receipts for the monthly period are punched and listed, the trial balance is prepared. All of the daily distribution cards are sorted in the proper sequence and the trial balance is taken. From the trial balance the accounting department prepares the final closing entries. These cards are combined with the regular daily distribution cards, then merged with last month's ledger reports. This group of cards is used to prepare the balance sheet.

The same cards are separated to general, expense, and personal accounts. All charges to accounts with three digit numbers are general ledger accounts, all

MECHANICAL JOB ORDERS

Description	Acct. Charge	Job Number	Amount
Install Pump on Wrapping Machine	600	2100	200.00
Install Plate Detector on Press	600	2332	150.00
Repair Light Fixtures & Adjust Brackets	646	2456	75.00
			425.00

EXHIBIT 11

SUPPLIES FROM STOCK ROOM

Account	Stock No.	Amount	Dec. 55
8111	2121	5.00	
8111	2122	2.00	
8111	3048	2.00	
8111	3060	3.00	
8111	9088	2.00	
8111	9301	40.00	
		75.00	

EXHIBIT 12

four digit numbers are expense accounts. Each group of general, expense, and personnel ledgers is prepared separately, creating a balance forward card for each separate account number. Upon completion of the ledger run, this balance forward card contains the balance in the account plus the actual expenses for the past period. The distribution cards are "pulled" and filed, and the prior balance

GENERAL LEDGER

0010 Cash in National Bank

Date Mo.	Day	Yr.	Reference	Source	Description	Debits	Credits	Balance
7	1	55	300	3	Balance from 6/30/55	100,000.00		
7	3	55	6209	1	Deposit July 3	1,000.00		
7	15	55	326	3	Sale U.S. Govt. Bonds	10,000.00		
7	25	55	6633	1	Deposit July 25	8,900.00		
7	29	55	398	3	Cancel CK A123456	150.00		
7	31	55	415	3	Correct Dep. July 20		900.00	

Source Code: 1. Cash Receipts 2. Fixed Journal 3. Journal 4. Voucher

EXHIBIT 13

EXPENSE LEDGER

8111 Supplies

Date Mo.	Day	Yr.		Reference	Source	Description	Debits	Credits	Balance
7	28	55		198	3	Building Stock	40.00		
7	29	55		1424	4	Western Transp. Co.	3.00		
7	31	55		373	3	Handyman Books	6.00		
7	31	55		377	3	Office Stock	50.00		
7	31	55		400	3	Mfg. Job Orders	10.00		
7	31	55	7	1527	4	Office Supply Co.	20.00		
7	31	55		427	3	Booklets and Leaflets	2.00		
7	31	55		442	3	Paper Stock	15.00		146.00

Source Code: 1. Cash Receipts 2. Fixed Journal 3. Journal 4. Voucher

EXHIBIT 14

forward cards are filed and held for ninety days, while the new general and personal account balance forward cards are filed for future use.

The expense balance forward cards, on the other hand, are merged with the budget expense cards. These budget expense cards are created each six months for a six-month period and contain the amounts per account budgeted for each department for the period. Inasmuch as these cards contain only the budgeted amount, the actual expense for the period must be obtained from the expense balance forward cards. The comparison is performed on the calculator by summarizing the actual expense from the balance forward card to the budget cards. The former are then pulled out and filed for future use (as the other balance forward cards were) and the budget card goes through the calculator to obtain the amount that each account is either over or under budget. These budget cards are then routed to the accounting machines for preparation of the departmental expense statement on a five-part form. Along with these statements, the expense

PERSONAL LEDGER

1008 John Johns

Date Mo.	Day	Yr.		Reference	Source	Description	Debits	Credits	Balance
7	1	55		300	3	Balance 7/1/55	80.00		
7	8	55		6262	1	Cash Received		10.00	
7	8	55		6263	1	Cash Received		50.00	
7	11	55	7	165	4	Advance Chicago	100.00		
7	11	55	7	176	4	Railroad Fare Chicago	20.00		
7	22	55		6491	1	Cash Received		25.00	
7	22	55		49	3	Expenses 7/15 Chicago		120.00	
7	31	55		145	3	ADJ Railroad Charge CGO	1.00		4.00CR

Source Code: 1. Cash Receipts 2. Fixed Journal 3. Journal 4. Voucher

EXHIBIT 15

account distribution cards are listed by account within department for a detailed department expense record.

Work—and More Work—for the Tabulating Department

The tabulating department has not been confined to preparation of general, expense, and personal ledgers. We feel that if we can utilize each tabulating card in at least three distinct functions, we are obtaining a maximum advantage of the system. The tabulating department processes each month approximately 250,000 new cards. Of these, about 12,000 cards comprise the information in support of the general ledgers. And the remainder are by no means preponderantly in connection with the detail ledgers. This will be clear when its noted that other applications are:

1. Writing all payrolls
   a. Branch (semi-monthly)
   b. Office (weekly)
   c. General (weekly)
   d. Executive (semi-monthly)
2. Social security reports
3. Preparation of Federal form W-2
4. Art and engraving inventory records
5. Addressing of house organ labels
6. Bank reconciliation of all payrolls
7. Billing for books and advertising (approximately 95% of all of our billing)
8. Retirement records
9. Personal history data
10. Property accounting records
11. Office stock inventory
12. Processing of all time cards for standard cost departments
13. All standard cost reports

In producing the general, expense, and personal ledgers, budget statements and related reports, the following equipment is used each month for the times indicated, at a cost in labor, overhead, machine rental, and supplies of approximately $400:

Description	Hours
Key Punch	24.8
Verifier	35.9
Calculator	1.0
Reproducer	6.9
Tabulator	15.7
Collator	8.7
Sorter	3.9
	96.9

Summing Up

We have found, since converting to punched cards, that great improvements have been made in our reporting and service operations:

1. We are now closed and have "profit flash" in the hands of management on the 7th and 8th working day of each month. Under our previous system it was usually the 12th and 13th working day.
2. The problem of balancing has been eliminated. Our procedures assure a

that, after the last batch of journal entries have cleared the tabulating department, we will have an accurate balance sheet within two hours.

3. The vouchers, invoices, journal entries, and cash receipts are in the files as soon as they are returned from the tabulating department, thus allowing us to search the files for original documents.
4. Departmental expense statements are in the hands of department heads not later than the 10th working day of each month.
5. Department heads are now provided with four itemized statements of charges to their accounts, which we were unable to give them before. Through this additional information, the department head has become more cost conscious. He inadvertently performs part of the annual audit as he checks the charges to his account.
6. When the time for the annual audit arrives, the auditors are supplied with complete ledgers for their own use. The ledgers, in many instances, become the auditor's work papers.
7. Financial statements, balance sheets, profit and loss statements by company and product are in the hands of management a full week earlier than they were before the present system was installed.
8. At the close of each month, it is possible to tabulate all cards for the 01 account and have the amount of payroll for the month. This has helped immensely in the preparation of the selected expense statement. Under our old method, it required one day for one clerk to gather this information, whereas now we have it in one hour. As a result, the clerk is available for other duties.
9. Department heads depend, to a large extent, on this detailed information in preparation of their annual budgets.
10. We have found some minor faults with the system. One is that current ledgers are not available until the end of the month. To alleviate this, however, when information is needed at an intermediate date, a special run is made with the cards.
11. Each month new ledgers are run, which carry forward year-to-date balances. Every three months complete "to-date" ledgers are run, and the individual monthly ledgers are destroyed.
12. The time between the trial balance and balance sheet runs permits us to make fast checks of our trouble spots and, if an error is located, it is still possible to make last minute corrections.

It has been found that occasional changes in procedure must be made and, in some instances, new procedures installed. It is definitely felt that the use of our present system can be improved and expanded. We plan to change our check-writing operation so that cards can be punched at the time the checks are written. Other areas of possible improvement are being studied. For example, there is need for a schedule of charges of service contracts for hundreds of office machines (typewriters, adding machines, dictaphones, etc.). Also, a practical extension of application of the system involves inventories. In conclusion, it is important to re-emphasize the necessity of completing the source document correctly and of establishing thorough, efficient procedures. The cards will produce only what is put into them.

Costing for Oil Well Drilling and Service Contractors

by FRANCIS L. DURAND

Chief Accountant, Port Arthur Stevedores, Port Arthur, Texas

The costs which go into drilling an oil well and means of attaching such costs in useful categories to particular jobs and particular equipment are here presented, with an illustration of how the information developed is advantageous in bidding and with suggestions as to ways in which it may likewise make for better control. Detailed actual job costs are the repository into which this information is gathered by the working of the accounting system described.

AN OILWELL DRILLING and service contractor is one whose operations embrace two distinct phases of contract operations in the oil industry. The basic distinction between the two phases is embodied in the contracts under which he operates. Normally, under a drilling contract, the contractor undertakes to drill the hole, furnishing the necessary equipment, labor, supplies, etc., and is compensated on the basis of a specific amount per foot of hole drilled. The terms of the contract specify what the contractor and the owner or operator of the lease are to furnish and further specify certain operations which entitle the contractor to additional compensation, based on an hourly or daily rate. The latter is normally termed "day work" and usually covers operations which are controlled by the operator. In contrast to the drilling contract, the service or "workover" contract is one under which the contractor is required to furnish certain equipment, labor, and specific supplies, and is compensated entirely on an hourly or daily rate. This type of contract is normally found on jobs where the operator wishes to perform operations on existing wells in order to enhance production.

A great many variations of the two basic types of contract exist. As an example, a drilling contract may call for the entire compensation of the contractor to be computed on a "day work" basis, eliminating compensation based on feet of hole drilled completely or it may call for footage compensation to a specified depth and "day work" to apply thereafter. One workover contract may call for the operator to furnish fuel and another may call for the contractor to furnish it. The rates specified in the contract upon which the contractor's compensation is based are the result of either negotiation or bids. In either case, the contractor, in order to quote a profitable rate must be aware, not only of his total operating cost but also of a breakdown of these costs.

For example, where a rig is used for either drilling or workover work, the contractor should be in a position to eliminate specific costs which are applicable to drilling operations but not to workover operations, when bidding on the latter type of contract. In some cases it may be advantageous to the contractor to be aware of his cost of operating the same rig on a drilling job and on a workover job, by cost classification, due to the variation in the use of the equipment on the two types of operation. Also, inasmuch as, when a contractor bids on a job, either a drilling or workover contract, he intends to use a certain rig on the job, it follows that he should have available cost figures on each of his rigs. It is very easy to see that the cost of operating a rig which is capable of drilling to 10,000 feet would not be comparable to similar costs on a rig which has a drilling capacity of 5,000 feet. Further, unit costs are desirable from the standpoint of cost control. If a contractor has two rigs, which are comparable in size and capacity, he would be interested in comparing cost of operation of the two rigs and investigating any great differences.

Drilling Costs and Their Identification with Jobs

Because costs incurred in the course of operations under a drilling contract are more inclusive than similar cost under a workover or service contract, the present discussion will be primarily related to drilling contract costs. Labor, of course, is a primary direct cost. In the majority of the cases, drilling rigs are operated around the clock in three shifts. The size of the crew, wages paid, overtime premium cost, etc., are fairly constant. Following labor, and an important factor in computing total cost of operations, are those items constituting payroll burden—payroll taxes, workmen's compensation and liability insurance, fringe benefits, etc.

Costs other than labor are quite varied in nature. Repairs and maintenance and rig operating supplies are two which are worthy of more than passing consideration. Such items as repair parts, costs or engine overhauls, etc., would normally be classified as repairs and maintenance. Manila rope, cable, small tools, etc., would come under the classification of rig operating supplies. Depreciation falls into two separate categories, that applicable to the machinery and equipment making up the rig exclusive of the drill pipe and that applicable to the drill pipe. Occasions arise when the rig is used without the drill pipe or with varied amounts of drill pipe. Cost of supervision furnished during the course of operations results from salaries and expenses of "tool pushers" and/or field superintendents. Other costs which must be considered are fuel and water, insurance premiums applicable to coverage on the equipment, rock

bits, drilling supplies, such as mud and chemicals, trucking, cement and cementing, etc.

The foregoing enumeration is probably representative of the major costs which are incurred by contractors under a drilling contract. However, under a workover or service contract, and possibly under a drilling contract, the terms of the contract may call for him to furnish these items but only at the expense of the owner or operator of the lease. When this occurs, expenses relative to furnishing the appropriate materials or services are reimbursable costs. The contractor pays the vendor but in turn bills a third party, the owner or operator of the lease. The cost of rock bits, trucking, cement and cementing, are examples of items which would probably be of such a third party nature under a workover or service contract.

Aside from wanting to know what his overall costs of operation are, by appropriate cost classification, a drilling contractor is also interested in knowing what his costs are applicable to operation of each rig and on each job. This can be fairly easily accomplished by incorporation into the code of accounts of appropriate designators indicating the rig and job to which the cost is applicable. Assume, as an example, that the expense designator for rig operating supplies is 452, and an expenditure is made for manila rope on Rig No. 2 while it is working on the Jones lease, Well No. 2. When processing the vendor's invoice for the manila rope through the accounting records, the invoice could be coded with the account number B-28-452—the letter indicating Rig No. 2 and the numbers indicating, respectively, the job and the expense. Subsequent posting to the subsidiary rig cost ledgers and cost sheets would get the cost of the rope into the appropriate classification under the cost of operating Rig No. 2 and the cost applicable to the contract on Jones Well No. 2.

In order to handle the cost of third party services and materials in a manner which will prevent failure to bill them, use of an identifying account number is recommended. As an example, assume that the contract on Jones Well No. 2 provides for reimbursement of the contractor's cost applicable to rock bits by the operator of the lease and that the account number for rock bits is 460. Rather than code the vendors' invoices on rock bits A-28-460 which would place them in the contractor's own costs a different account, representing third party items, should be used, this might be account No. 500. In processing the invoices on the rock bits, the coding A-28-500 would then be appropriate. On posting to the subsidiary rig cost ledgers and job cost sheets, third party materials and services on Rig No. 2 and Jones Well No. 2 would be charged for the cost of the rock bits. Upon processing the invoice on Jones Well No. 2, the portion applicable to third party items would be coded A-28-500 and

credited accordingly, rather than being handled as an income item. Upon the completion of the job and processing of all invoices applicable, account No. 500 should have no balance, indicating that all third party items have been properly recorded. Similarly, in the subsidiary rig cost ledger, any balance in account No. 500 would have to represent either a receivable applicable to an unbilled third party item or an error in processing such an item.

Cost Distribution: Labor, Repairs, Operating Supplies, Depreciation

Drilling contractors' accounting systems often call for submission of daily time sheets as the basis for preparation of the payroll. These time sheets normally indicate both the applicable rig number and the job on which the rig is operating for each day during the pay period. When processing the payroll for the period, it is a simple matter to cost each time sheet and distribute labor costs applicable to each rig and job, by employing appropriate coding as noted above. Payroll burden, the liability for payroll taxes, insurance premiums based on payrolls, etc., are normally determined at the time the payroll entry is prepared. Distribution of these costs to the appropriate rig and job is easily done by application of predetermined percentages to the labor distribution and coding accordingly.

When the drilling contractor maintains no repair facilities or supplies stock, proper distribution of the cost of repairs and maintenance and rig operating supplies does not present a difficult problem. Repairs would be made as required by employment of facilities other than the contractor's and supplies would probably be purchased for the individual rig as required. Distribution could be readily accomplished by proper coding of the vendor's invoice. Where, however, the contractor maintains a repair shop and/or a storehouse, distribution of these costs to the individual rigs and jobs has to be performed on some other basis. This can be accomplished, as an example, by employment of repair orders and warehouse requisitions to be costed and coded in the same manner as vendor's invoices, similar to procedures in manufacturing companies.

Another problem presents itself in connection with the costs of repairs and maintenance and rig operating supplies. Replacement of certain equipment parts, such as pump liners, and of items of rig operating supplies, such as the drilling line, are normal costs in the course of the operations of a rig. These costs may be incurred several times a year but are seldom a cost applicable to an individual job. When using the subsidiary rig cost ledgers to determine, the daily cost of operation of a specific rig, if a long enough period of time is taken into consideration, this factor will not materially affect daily operating costs computed, but the subsidiary job cost sheets will not be entirely accurate.

A drilling line may be good for 100 days of rig operation. If a line is purchased for a rig on Job No. 25 and not replaced before the rig is on Job No. 29, the former will bear the entire cost of the line, even though it was used on Job Nos. 26, 27 and 28. If the cost of these items is material, when compared to the entire cost of the jobs, the profit and loss on each job will be distorted. A suggested corrective is to compute, from past experience, a unit cost, such as per footage of the hole drilled or per rig operating day, for the items which would fall within this category. Using a variance account, each job could then be charged for its proportionate portion of the applicable cost based on the predetermined unit cost. Large balances in the variance accounts would, of course, indicate inaccuracies in the unit cost and call for redetermination of it.

The method employed to compute depreciation charges, has a major effect upon any operating cost derived from the accounting records. For costing purposes, the most logical manner for drilling equipment to be depreciated, is to spread its cost over its operating life. The operating life of a drilling rig can be expressed in terms of "rig operating days." The number of rig operating days which is estimated to constitute the useful life of the rig divided into its cost results in a depreciation rate of a specific dollar amount per rig operating day. The employment of this method of computing depreciation charges for cost purposes automatically eliminates the burdening of costs related to a particular rig with depreciation charges applicable to periods of time when the equipment was idle.

It has been mentioned that depreciation charges on drill pipe should be segregated from those applicable to the remainder of the equipment, due to variation in the amount of drill pipe employed with a rig on different jobs. The computation of depreciation on drill pipe, therefore, presents a different problem from that involved in computation of the depreciation on the drilling rig. One method which may be employed is that of charging depreciation of drill pipe to specific jobs on the basis of a unit cost per foot day. This method involves provision of depreciation of drill pipe on the basis of the number of feet in use each day.

Depreciation rates stated in amounts per "rig operating day" or "cost per foot per day" can be determined by careful evaluation of past experiences of the contractor, data furnished by the manufacturer, etc. However, the rates once determined, under this method, are not different in nature from depreciation rates determined under any other method and are simply an estimated distribution of the capitalized cost of the equipment. As such, they should be subject to adjustment if the contractor's operations prove that rates used are providing inadequate depreciation or are depreciating the equipment too rapidly.

Cost Distribution: Supervision, Truck Operations

A drilling contractor ordinarily employs one or more supervisors who oversee the field end of his operations. He may have a tool pusher for each rig or for rigs operating in the same field, plus one or more field superintendents who are responsible for all rigs operating within given geographical locations. These supervisors are customarily furnished with transportation and expense accounts. In the majority of the cases, the wages of the tool pushers and field superintendents, cost of transportation and their expenses can be associated with the operations of one or more rigs. When only one rig is involved, distribution to the appropriate subsidiary rig cost ledgers and well cost sheets simply involves appropriate coding of the entry recording payroll distribution, etc. When more than one rig is involved, the contractor may employ one of several methods which effect distribution of these costs and expenses. One method would embody distribution on the basis of time reports submitted by the personnel whose wages and expenses are involved. Another would distribute these costs on the basis of direct labor charges to the various rigs employing the services of these supervisors during the period covered by the disbursement for wages, expenses, etc. A third method would combine the other two. Some wages and expenses would be distributed on the basis of time reports and others distributed on the basis of direct labor. The distribution on the basis of time reports has the effect of recognizing that some operations require more constant supervision than others. Distribution on the basis of direct labor has the advantage of being less complicated.

Distribution of other costs, such as fuel and water, trucking, etc., can be accomplished fairly simply by appropriate coding of the vendor's invoice. Where a contractor maintains his own fleet of trucks, a different problem exists. Here, it is necessary to maintain costs on the operation of the trucks in order to properly distribute them. This is particularly true where the trucks are used on jobs where the contractor receives compensation for their use. As an example, on most workover or service contracts, the contractor is reimbursed for the cost of moving his equipment on the lease. If he uses his own trucks to accomplish this move and charges the operator of the lease, it is apparent that he should want to segregate any profit or loss involved in such an operation from that resulting from rig operations. Therefore, where trucking is accomplished through the use of the contractor's own equipment, it seems apparent that subsidiary records should be maintained on the cost of the operation of this equipment, thereby allowing for a computation of unit costs on each truck, trailer, etc. In distributing trucking costs to each job the contractor has the alternative of

using the predetermined unit cost on the equipment used or basing the distribution on current rates used by trucking contractors for similar equipment.

Preparing Bids on Information Furnished by Cost System

A contractor who has at his fingertips a detailed breakdown of what it costs him to operate his equipment is in an enviable position with respect to bidding. The majority of drilling contracts and/or work-over and service contracts are either let out on bids or are negotiated. Bid proposals usually detail what items of equipment and supplies are to be furnished by the contractor and what is to be furnished at the expense of the operator of the lease. Using figures compiled from his subsidiary rig cost ledgers or from job cost sheets on comparable jobs, the contractor is able to arrive at the best possible estimate of what his cost would be in fulfilling the contract. With these figures as a basis and making allowances for overhead and profit, he is able to submit a bid which, barring unforeseen complications, would return a fair profit without being out of line.

The contractor's bid would, of course, have to be tempered by what other contractors in the area are asking on similar contracts which, at times, can be estimated within fairly close limits. This factor, however, should not be the controlling factor in the arrival at the bid figure. Suppose that a contractor receives a bid request on a contract and has only one rig available to do the job. Using his cost figures, he computes his estimated direct cost on the contract to amount to $3.10 per foot. Adding an allowance of 20¢ for overhead and 30¢ for profit, the contractor arrives at a bid figure of $3.60 per foot. If the contractor knows that his competitors are asking approximately $3.00 per foot for similar jobs, he would not be wise in attempting to meet this price, since it is below his direct costs. If, however he estimates his competitors are asking $3.40 for similar jobs, he may decide to reduce his bid accordingly. This decision could be affected by the possibility of the contractor being able to get other work for the rig, from which he could expect a larger return than that afforded by the $3.40 bid.

In order to illustrate the considerations which have been set out, there is followed through in this section of the article the steps taken by a contractor in computing a bid on a workover contract and on a drilling contract. Assume that contractor receives a request for two bids, one on a drilling contract and one a service contract. The requests furnish the details shown in the top portion of Exhibit 1. The contractor has two rigs available, Rigs Nos. 2 and 3, which are comparable in size and capabilities, the only difference being that Rig No.

2 operates on diesel fuel and Rig No. 3 operates with natural gas as fuel. Using his rig cost ledgers the contractor obtains the per day operating costs with respect to each rig, shown at the lower left of Exhibit 1. These per day costs would be computed by selecting a period of prior operations, taking the costs of operations for each element of cost on each rig during the period, as indicated by the subsidiary cost ledgers, and dividing by the number of rig operating days during the period.

The contractor also has available a 8,000' string of drill pipe on which he has computed costs, depreciation, maintenance, etc., of 1¢ per foot per day, as likewise noted at the lower right of Exhibit 1, along with cost of trucking and rigging up the rigs from their present locations to the location of the two proposed jobs. Further, the contractor has drilled other wells, to comparable

INFORMATION ACCOMPANYING BID REQUESTS

Drilling Contract - Jones Lease, Well No. 4

1. Hole to be drilled to 8,000' on a footage basis.
2. Contractor to furnish all necessary equipment, together with labor required.
3. Contractor to furnish fuel, mud and chemicals, and trucking.
4. Lease operator to furnish water, cement and cementing, electric logging, casing, etc.
5. Bid is requested on a per foot basis to 5,000 feet plus rates for use of contractor's equipment on "day work", per day, with and without drill pipe.

Workover Contract - Black Lease, Well No. 2

1. Pull tubing, clean-out and recomplete 12,000' well.
2. Contractor to furnish all necessary equipment, together with labor required.
3. Operator of lease to furnish natural gas fuel, water, trucking to a maximum of $3,000, and all other supplies and services required to do job.
4. Bid is requested on the basis of a flat per day rate, without drill pipe, plus trucking.

DATA FROM ACCOUNTING RECORDS

Per Day Operating Cost

	Rig No. 2	Rig No. 3
Labor	$300	$320
Payroll burden	45	48
Repairs & maintenance	15	24
Supplies	20	28
Fuel	27	16
Supervision	45	45
Insurance	40	40
Depreciation	78	69
Total Rig Operating Costs	$570	$590

Cost of Moving Equipment and Rigging Up

	Rig No. 2	Rig No. 3
To Jones Lease	$1,500	$3,000
To Black Lease	3,500	3,000

Note - Drill pipe costs are 1¢ per foot per day.

Cost Data From Comparable Jobs

Number of days required to drill to 8,000'	15
Bit cost (number of various types of bits used multiplied by current cost)	$3,500
Cost of mud and chemicals (quantity used multiplied by current costs)	$3,000

EXHIBIT 1

depths, in the field in which the Jones lease is located. So, by referring to his job cost sheets and other data on file, he is able to compute the data also shown at the lower right of Exhibit 1.

Assembling the foregoing information would be the next step. This can be accomplished on work sheet, as illustrated by the upper half of Exhibit 2. Experience has indicated that the contractor's overhead is approximately 10 per cent of direct costs. He includes in his bid an estimated profit of 10 per cent of direct costs. Using these figures, the contractor then proceeds to work up a bid on each job for both rigs as shown in the lower half of Exhibit 2. Assume that the contractor is aware of the fact that other contractors are getting $2.60 per foot on jobs similar to that covered by the bid request on Jones No. 4, with day work rates at approximately $675 without drill pipe and $775 with drill pipe, it is apparent that his bid on this job would be on the basis of his computations for Rig No. 2, these figures being within the range of rates being received by other contractors. On the other hand the estimated direct cost per foot on Rig No. 3 ($2.375) plus the allowance for overhead per foot ($0.238) totals $2.613, a figure which does not include an allowance for profit and is higher than the $2.60 being received by other contractors.

By bidding on the Jones No. 4 on the basis of the computations for Rig No. 2 the contractor thus limits himself to using Rig No. 3 on the Black No. 1. In this case, however, such a limitation does not greatly effect his bid. In fact, Rig No. 3 would be the logical choice for the job. Due to the availability of fuel at no cost to the operator, rig operating costs are comparable to similar costs on Rig No. 2 where the contractor would have had to furnish diesel fuel at his own expense. Trucking costs to the Black lease for Rig No. 3 are estimated in an ammount within the maximum which the operator of the lease will pay for. If Rig No. 2 were to be used on the job, it would be necessary to take into consideration trucking costs of $500 in excess of the $3,000 maximum chargeable to the operator provided for in the bid request.

In reviewing the foregoing, it should be borne in mind that the figures which are used are purely hypothetical and are not intended to represent any actual costs, etc., either in amount or in relationship to one another. They are used only for illustrative purposes.

How Useful Cost Comparisons Can Be Made

Comparisons on rig operating costs on equipment of similar sizes and capacities, of the same rig for different periods, and of drilling two similar wells may be regarded as valuable in highlighting any out-of-line costs. If, for

COST ASSEMBLY WORK SHEET

Jones No. 4

	Rig No. 2	Rig No. 3
Rig operating costs:		
15 days @ $570.00 per day	$ 8,550	
15 days @ $590.00 per day		$ 8,850
Drill pipe costs (estimated accumulated footage used each day @ 1¢ per foot day)	650	650
Trucking costs	1,500	3,000
Bit costs	3,500	3,500
Mud and chemical costs	3,000	3,000
	$17,200	$19,000
Cost per foot - 8,000 feet	$ 2.150	$ 2.375

Black No. 1

	Rig No. 2	Rig No. 3
Rig operating costs:		
Per day	$ 570	$ 590
Less - fuel furnished by operator (natural gas)		16
	$ 570	$ 574
Trucking	$ 3,500	$ 3,000

BID COMPUTATION

Jones No. 4

First 5,000 feet:	Rig No. 2	Rig No. 3
Direct costs per foot	$ 2.150	$ 2.375
Overhead	.215	.238
Profit	.215	.237
Approximate bid	$ 2.580	$ 2.850
Day rate after 5,000 feet:		
Rig operating costs	$ 570	$ 590
Overhead	57	59
Profit	57	59
Rate without drill pipe	$ 684	$ 708
Drill pipe:	**Rig No. 2**	**Rig No. 3**
8,000' @ 1¢ per foot per day	$ 80	$ 80
Overhead @ 10%	8	8
Profit @ 10%	8	8
Rate with drill pipe	$ 780	$ 804

Black No. 1

Flat rate per day:	Rig No. 1	Rig No. 3
Direct costs per day	$ 570	$ 574
Overhead	57	57
Profit	57	57
Approximate bid:		
Per day	$ 684	$ 688
Trucking	$ 3,500	$ 3,000

EXHIBIT 2

instance a contractor who owned the two rigs involved in the illustration which has been given decided to investigate the fact that the costs per day of repairs and maintenance and operating supplies for Rig No. 3 were $9 and $8 higher, respectively, than similar costs for Rig No. 2, such an investigation might reveal unsound practices with respect to purchasing of operating supplies, if such supplies are procured by field personnel, or failure to employ proper preventive maintenance. Similarly, if the contractor had drilled two wells in the same field with comparable equipment and the cost of the second well was considerably higher than the cost of the first well, comparison of the job cost sheets on the two wells would indicate whether or not the higher costs were due to higher cost in one particular classification or to a longer period of time being required to drill the second well.

Two Principles Are Basic to a Useful System

The basic principles of a cost system for an oilwell drilling contractor has been outlined in this article. No attempt has been made to cover all of the factors which would have to be considered, because the details are largely dependent upon the operations of each contractor. There are, however, two basic principles which are worthy of repetition. First, the system should provide costs which can be related to the operation of specific equipment properly classified by categories or types. Second, the system should be so designed as to facilitate accurate costing of individual jobs.

A Look at the Accounting Policies of Oil Companies

by CLARENCE L. DUNN

Associate Professor of Accounting, Louisiana State University, Baton Rouge, Louisiana

On the basis of inquiries made of representatives of oil companies (including both large units and small ones), the author presents findings as to accounting policies followed in the oil industry. A general finding of variety is apparent but existence of concensus in some areas is also indicated. Policies reviewed include those relating to recording of revenue, valuation of inventories, application of various categories of expenses, and treatment of the variety of fixed asset classifications charteristic of the industry.

OPERATIONS OF AN INTEGRATED oil company are extremely complex, particularly in the exploration, production, and refining phases. The questions of valuation, depletion, and depreciation are perhaps more difficult than are generally found in any other industry. The problems are further complicated by the fact that the state and Federal income tax regulations are often based on expediency rather than on sound accounting principles and, consequently, call for specialized treatment. It is appropriate to maintain, therefore, that scientific procedures cannot cease with the actual oil production and refining but must be used by oil company accountants in deciding numerous unusual accounting problems.

This article reflects a study which I recently undertook of accounting policies for drilling and production costs. This study, which is still in process, has been restricted to oil producers operating in Louisiana and East Texas fields. It includes several major oil companies, but small producers have not been neglected. Time and circumstances have not permitted inclusion of accounting procedures and methods in this study, except as these would throw light on the reasons for the adoption of particular accounting policies. It may be well, therefore, to distinguish at once between policies and procedures. For the purpose of the study an accounting policy was taken to be the general treatment adopted by a particular company for the application of an accounting principle. Accounting procedures, on the other hand, are considered to comprise techniques or methodology of recording the accounting data.

Revenues Accounting

One of the first topics discussed with oil company accountants concerned the treatment given various types of revenue. It can be stated that most of the small producers are primarily concerned with only one kind of revenue—sale of crude oil and gas—and do not complicate their accounting with a detailed segregation of minor types of revenue. The larger producers, on the other hand, do attempt to account for miscellaneous revenues from different sources. Any type of gas sold, including residue gas, is recorded as operating revenue. Income from minerals other than petroleum (for instance, sulphur) is also recorded as operating revenue, although in some cases the oil company itself does not produce such minerals but merely has an interest in the production. Gas produced by the company and consumed in its own operations is generally recorded in gross revenue from sale of crude oil and gas at "field prices" and charged to operating departments at the same prices. Usually, however, for financial statement purposes, sales and cost of sales are reduced by the amount involved.

In connection with revenue from profit-sharing agreements, including gas and oil royalties, the accounting treatment depends on whether the property is company-operated or operated by other companies. Where the property is company-operated, the income is taken into gross income as earned, that is, all revenue and expenditures are accumulated in the company's accounts. When the property "pays out," the nonoperator's portion of the net income after pay out is credited to his account and charged to operating expense. Where the property is operated by other companies, royalty income received is recorded as other gross operating revenue after applicable leasehold costs have been fully amortized. This situation reflects the fact that oil producers have long been inclined to look upon each property as a venture that must justify its own existence. From this point of view, in spite of what accountants may say, the venture does not make a profit until the total investment is returned. "Paid out" means simply that there is no profit until the income in its cumulative aggregate has passed the total investment.

A special problem is encountered in connection with "carried interests". A carried interest is the beneficial interest in oil retained by the assignor of oil and gas rights. The lessee's interest is called a working interest in the property. The rights of a carried interest are limited to the express terms of the contract. Ordinarily, the lessee operating the property is responsible for the records by which the amount accruing to the benefit of the carried interest is determined. If the working interest earnings do not pay out the expenditures, then the

carried interest will receive no benefit. On the other hand, the working interest has no claim against the carried interest for any loss resulting from the development and operation of the property.

It is readily apparent, therefore, that, where one oil company is being "carried" by another producer, there is no income to be taken into operating revenue until after pay out. In instances in which the company is the operator, the general policy, it appears, is for the operator to credit against its shares of the expenditures its prorata portion of the revenue. The carried interest's portion of the revenue is credited to his account until the development costs and operation expenses which were charged to his account are recovered. After carried interest properties pay out, they are usually accounted for as ordinary joint operations.

Usually an oil producing company will have other miscellaneous sources of revenue, such as income from drilling, rental of drilling tools, hauling, etc. In most cases in which such income is encountered, the revenue is treated as a recovery of costs and is offset against operating expenses. This appears to be true whether the equipment is used by a joint operator or by any other outside company. In some cases, however, the outside company may be billed specifically for such items. They are then included in "other income from operations" by the billing company.

Of course, the major source of revenue for any oil producer is the sale of crude petroleum. So ready has been the market for it over the years that it is perhaps natural to expect that producers would consider oil production as revenue, whether actually sold or not. This viewpoint is further encouraged by the fact that most producers do not keep the crude in storage for any great length of time. Nevertheless, the writer's research has brought out that most producers take crude oil into revenue at the established posted field price on a realized production basis, that is, when run to the pipe line. Oil in lease tanks is also taken into income when run from the tanks to the pipe line at the established posted price.

Practices in Accounting for Inventories

The study which is being undertaken gives considerable attention to the treatment of inventories, particularly of crude petroleum inventories and of materials and supplies. It is perilous to generalize with respect to this area of the study. Oil company accountants were asked such questions as the following:

1. What methods are employed of applying costs to crude oil inventories and to cost of sales?
2. What costs are taken into account in determining these inventory values?
3. Are crudes priced grades, groups, or overall?

4. If the "lifo" method is employed, what base period is used and what periods and methods are used for pricing inventory accumulations?

The one safe conclusion is that considerable variation exists between companies in these matters. The majority of the oil companies operating in the Louisiana and East Texas Fields have adopted "lifo" as their inventory method, but there seem to be significant differences in the application, insofar as techniques are concerned. In some companies, crude oil inventories are priced by groups. In others an aggregate basis is employed, with one price for all such inventories. Also, as can be expected, not all companies using the "lifo" method have adopted the same base (or starting) period.

As to the periods used for pricing "lifo" inventory accumulations and the methods employed for computing such accumulations there appears to be some lack of uniformity here also. In general, however, annual periods (usually calendar years) are used for pricing quantity accumulations for year-end inventories and monthly periods are used for interim monthly inventories. Ordinarily, quantity increases during a calendar year are considered to have accumulated by months from the first acquisition subsequent to January 1. Quantity decreases, on the other hand, are applied first to monthly increases, in reverse order of acquisition and then, if necessary, to the base inventory. In computing the inventory value of a particular month's quantity increase, a common procedure seems to be to price the increment at the month's average cost, determined by dividing the aggregate cost of all crudes produced or otherwise acquired during the month by the aggregate quantity so acquired.

Where producers use "cost or market, whichever is lower" for inventory valuation purposes, the average sales value per barrel at the inventory date is usually taken as market value. Costs taken into account in determining these inventory values encompass all costs of producing the oil and pipage to the point of inventory. The list of such costs generally includes lease and well expense, lease rentals, payments to profit-sharing agreements, loss on carried interest, joint operations, taxes, depletion and depreciation, production research expense, surrendered leases, dry hole expense, test well contributions, geologic leasing and scouting, geophysics exploration and research, geologic research, geochemical research, employee welfare expense (field), and certain departmental overhead expenses. It should be pointed out, however, that, with the increased adoption of the "lifo" method producers have largely gotten away from the idea of valuing crude petroleum inventories at the lower of cost or market.

With respect to the accounting for materials and supplies, it can be stated that practically all of the oil producers with whom the matter was discussed apply average costing to all materials and supplies inventories. One accountant

stated that his company uses a "modified lifo-average cost basis", meaning that the prior month's price card is used to price all current month's issues before current receipts are recorded. Adjustments to reduce these inventories from cost to a lower market price are apparently not commonly made. The main reason offered is that it just is not done, primarily because steady inventory turnover of materials and supplies and fairly stable acquisition prices for most items eliminate the need for adjustment to market.

Materials and supplies are carried in the balance sheet as current assets. Warehouse stocks could be broadly classified in two categories, oil company tubular goods and miscellaneous supplies. Items in warehouse stocks ordinarily include casings, pumping units, well-head connections, and tanks. To the extent possible, however, most producers purchase casings for delivery direct to the well, so that the cost goes directly into well cost. Also, tanks may not be stocked unless one is withdrawn from service temporarily. Drill pipe is another item which ordinarily is not carried in materials and supplies stocks in large quantities. When new drill pipe is issued to a rig, it becomes a part of drill tools investment. Used drill pipe is usually continued in the fixed asset accounts. If drill pipe, once issued, is later transferred to storage, it is considered stored or stand-by drill tools investment.

Oil producers, in accordance with general accepted practice, obtain a physical inventory of materials and supplies once each year. The inventory-taking is usually carried out on a rotation schedule during the last three to six months of the year, with a physical inventory of all items obtained at least once each year. Shortages and overages, as revealed by book inventories, are then adjusted to physical inventory figures through charges or credits to miscellaneous operating expense.

Recognition and Determination of Operating Expenses

In connection with operating expenses it is again difficult to generalize as to accounting policies followed by oil producing companies. It appears to be true that the distinction between operating expense and administrative expense is made on the basis of functions or activities. A rather typical classification of administrative expense according to functions might be: general executive, general supervisory, treasury, employee relations, general purchasing, general accounting, and other functions of a similar nature. All other functions, which are more directly connected with operational activity, are then considered operating functions. Not all companies, as could be expected, recognize the same components of operating expense. A representative list includes the following

expenses: dry hole contributions, well work-overs, normal renewals and replacements, ordinary repairs, depreciation, depletion, field supervision, field utility services, taxes and insurance, transportation, lease and well expense, lease rentals, surrendered leases, production research expense, test well contributions, and payments to profit-sharing interest.

One doubtful item discussed in more detail later, consists of intangible drilling costs. Some companies capitalize these for financial accounting purposes. Others include this item under operating expenses. Also some companies carry all research and development costs in a separate category not under the producing department. Other companies include such items as geologic leasing, scouting, and research, geophysics exploration and research, and geochemical research in the operating expense category.

Warehouse operating expenses are ordinarily accumulated as a separate expense classification, that is, in a separate ledger account. For statistical cost statement purposes, field warehouse operating expenses are commonly distributed to drilling jobs and lease and well expense on the basis of the number of producing and drilling wells in the district. The larger producers usually have several central warehouses which can be called distribution-center warehouses. Expenses of these warehouses are often allocated to the various operating and capital accounts to which the warehoused material is charged. This distribution is best accomplished by applying a predetermined rate to each supply item issued. One major company does not make distributions described above except for statistical cost statements, on the theory that such allocation on the books would amount, to some extent at least, to capitalizing overhead in well costs.

Distinguishing Between Capital and Operating Outlays

In the study here being reported on, one important question sought to discover what policies are in effect for distinguishing between capital expenditures and operating expense. The policy stated in the policy manual of one major producer is:

> "All expenditures which are incurred and utilized in production which has become a part of, or necessary to, the sales of finished products or services for the current year are considered expenses. Expenditures for properties or benefits of a life duration of more than one year are considered capital expenditures."

It was indicated that, more often than not, the "dividing line" between capital and revenue expenditures under this rule involves the nature rather than the amount of the expenditure. For example, replacements are expensed or capitalized according to the type of equipment and whether the expenditure

is of such magnitude that it could not have been anticipated in determining the depreciation rate.

Nevertheless, it appears that many companies use a specified amount as a dividing line between capital and revenue expenditures, with items below this amount more or less arbitrarily classified as expense. Generally speaking, for most companies, all additions to plant and all expenditures in excess of a minimum amount are subject to review and authorization as to the account to be charged. Although there are exceptions to this, it can be concluded that more significance is placed on the nature of the item than on the amount of expenditure involved in the capital versus revenue decision.

In this connection, more particularly, an attempt was made in the questions asked to determine the usual treatment in capitalizing or expensing items such as the following: company produced utilities, warehouse issues of new and used materials, warehouse expense and field supervision (already commented on), dry hole contributions, and depreciation of drilling tools. Most of the oil producers contacted had very little of company produced utilities but, where such are used, they appear to be charged to expense or the capital project, according to their use, on a predetermined rate basis. Dry hole contributions are universally expensed. Ordinarily, depreciation on active drilling tools is capitalized as a part of drilling costs, but in each case where a well is completed as dry hole, the depreciation is expensed as a part of dry hole costs.

Intangible Development Costs; Tangible Lease and Well Investments

Brief reference has already been made to the matter of accounting policies for intangible drilling and development costs. Oil producing companies consider that intangible development costs, as a general definition, represent capital expenditures in connection with drilling of wells and preparation of wells for the production of oil and/or gas. They are construed generally as including those drilling and development items which, in themselves, have little or no salvage value. They usually include all drilling labor, rig rental, rig supplies, tool rental, derrick and foundation costs, preparing location, bridges and canals, well roads, supervision, district expense, coring, testing, water, gas, cementing, transportation, pipe and fittings less than a given size, mud and water pits cost, mud treating, and special services.

Intangible development costs for productive wells are ordinarily capitalized for book accounting purposes. When such costs are incurred in connection with a dry hole, the costs are expensed as a part of dry hole contribution costs. On the other hand, the general policy for tax purposes is for oil operators to expense

intangible development costs in accordance with the rules set forth in Section 39.23(m)-16 of the Federal income tax regulations. The oil operator is granted the option to either capitalize intangible drilling and development costs (in which case they are recoverable through depletion or depreciation, depending upon the nature of the expenditure) or to deduct such costs as expense in the year incurred. The election under the option, once made, is binding for all subsequent years. This option to expense intangible drilling and development costs is of great importance when percentage depletion is used, since the expenditure, if treated as a deductible expense, reduces taxable income and percentage depletion may also be taken.

Most oil producers consider tangible lease and well investment to consist of all property and equipment which has a significant salvage value and/or a useful life of over one year. The tangible investment cost would include installation and other costs of placing the property and equipment in active service. When tangible lease and well investment is transferred from one location to another, two problems present themselves. First, are intangible costs also transferred, retired, or left in the investment accounts at the original locations? Secondly, what is the basis for determining the amount of the investment involved in the transfer or retirement? As to the first question, when tangible investment is transferred from one location to another (or retired), some oil companies in their accounts handle the intangible costs as a retirement at its carrying value under the theory that, if the tangible investment is removed, then the existence of related intangible costs at the old location and in the accounts is no longer justified. Probably the majority of producers, however, leave the intangible costs in the original accounts, except when materials and supplies are transferred "in place" to another account.

When tangible lease and well equipment is transferred from one location to another or retired, there is again some difference in accounting treatment from one company to another. Some companies attempt to trace the historical cost of such items and to show the applicable amount of depreciation in the accounts. One major company stated that its tangible lease and well equipment is transferred from one location to another at condition value. The difference between condition value and historical cost is left in the asset account as "no item" money. Ordinary retirements of tangible lease and well investment for this company are credited to plant accounts at condition or salvage value. Other retirements are credited at cost or book value. Ordinary retirements are charged to an inventory, receivable, or other appropriate control, and extraordinary retirements are charged to profit and loss. Ordinary retirements are those that were anticipated in the determination of the depreciation rate. Extraordinary retire-

ments are those not contemplated in the determination of the depreciation rates and include the following:

1. Retirements as a result of a substantial loss from fire, storm, explosion, or other catastrophe.
2. Retirements of an entire depreciable group.

With respect to renewals and replacements of tangible investment, apparently most oil companies retire the cost (or book value) of the old asset and capitalize the cost of the new, including the cost of new installation. There are exceptions to this. One company expenses in total all replacements of tangible investments. Installation costs in connection with replacements are also expensed. The original cost of installing the equipment being replaced remains in the investment account and is assigned to the new item.

What Write Off Policies Are Applied to Dry Hole Costs?

Another group of questions presented in the survey concerned accounting for dry holes. It can be stated that very little distinction is made in accounting for wildcat wells and field wells except that separate accounts may be kept for exploratory dry hole expense and development dry hole expense. Ordinarily, no provision is made for charging dry hole expense with a portion of drilling in progress at the end of an accounting period. At the end of each month or at the end of the year, a charge is made to dry hole expense for the accumulated costs of all wells completed dry.

Sometimes, in the drilling of a wildcat well, a prospective producing horizon is passed and the well is drilled deeper for the purpose of discovering additional productive horizons. Here there is a question as to whether the deeper drilling should be charged to dry hole expense if the only production secured is from the shallower horizon. It is probable that most oil producers consider the deeper drilling cost as an appropriate charge to dry hole expense, although some companies capitalize the total drilling cost and write off the amount for the section below the productive depth as amortization of intangible development costs (wells abandoned). Ordinarily a similar treatment to the above is also made by the company when a portion of a hole is abandoned and the hole is plugged back to a shallower depth and sidetracked by directional drilling to a new objective.

Accounting for Plant and Structures, Etc.

An oil producing company has still other fixed assets than have been dealt with so far, including lease equipment, field utilities, gasoline plants, gathering systems, general headquarters and district headquarters investment, marine

equipment, and drill tools. Expenditures for additions and extensions for such items are ordinarily considered capital additions if they fall in one of the three following categories:

1. New plant and equipment purchased or constructed, including related transportation, installation costs, etc.
2. Extension of existing properties, including alterations and/or replacements with improved or superior parts (except for items of small unit value), provided such "betterments" are expected to result in increased earnings or productive capacity even when service life is not extended.
3. Expenditures necessary to rehabilitate and restore to normal working efficiency plant and equipment that has been purchased in a deteriorated or otherwise unsuitable condition.

On the other hand, renewals and replacements are usually charged to expense unless they are in replacement or renewal of a complete unit of plant and equipment or the replacement of a portion of a unit when the replacement will materially alter the nature of the unit or increase its capacity for service beyond the period contemplated in setting the depreciation provisions. In situations in which the "renewals and replacements" are not deemed proper charges to expense, they are charged to the depreciation reserves by some companies and fully capitalized by others. When these charges are capitalized in plant and equipment accounts, the units replaced are taken out of the plant accounts at cost or book value.

Projects which involve the relocation of existing equipment when dismantlement occurs on one operating unit and re-erection (relocation) occurs on another may be recorded as retirements with respect to the dismantled equipment and as capital additions with respect to the re-erected equipment. Costs of dismantlement are either charged to the reserve for depreciation of the unit where dismantlement occurs, or expensed. The cost of transporting and re-erecting the equipment, including the cost of additional materials and the condition value (or the book value, for certain companies) of the original property are then considered capital additions of the unit where re-erection occurs. Where only one operating unit is involved, the usual procedure is to charge to expense the expenditures incident to altering and relocating existing equipment, unless the alteration results in an increase in physical property or in its productive capacity.

In connection with retirements (including sales and transfers) of plant investment other than intangible development costs and lease and well investment discussed earlier, there are two principal questions which were given consideration in the review of accounting policy for oil producers. These questions are: (1) What basis is used for determining the amout of investment to be credited to fixed asset accounts? and (2) What accounting treatment is made of the retirement charge? Research showed that not all oil companies follow the same

policies with regard to these problems and also that different procedures may be followed by the same company, depending upon the type of retirement. For example, one oil producing company stated that the amount of investment to be credited to fixed asset accounts is determined in one of four ways, namely:

1. Gross cost as recorded in the accounts.
2. Condition value (current market value discounted by specified percentages for second class and third class material or discounted according to contract where joint operations are involved).
3. Salvage value (amount received from casual sales or estimated "junk" value).
4. Average book cost per foot of pipe (used in connection with retirement of pipe in gas plants, since tangible and intangible costs are combined).

In this particular company, each plant and equipment retirement is classified as either a sale, an ordinary retirement, or an extraordinary retirement. A sale is confined to the disposal of an entire unit within a depreciable group which clearly occurs earlier than the time contemplated in the determination of the depreciation rate. Casual sales of individual items of equipment are considered as ordinary retirements. Ordinary retirements also include all planned retirements of incomplete operating units and retirements of complete operating units which reasonably could have been contemplated in the determination of the depreciation rate. Other retirements, including those resulting from fire, storm, flood, explosion, or other catastrophe, and retirements of an entire depreciable group are classified as extraordinary retirements.

The handling of the retirement charge for this company depends on the decision as to the type of retirement. For example, ordinary retirements are recorded in either of two ways:

1. The investment control is credited and the applicable material inventory, accounts receivable, or other appropriate control is charged with the condition value or salvage value of the equipment.
2. The cost of the equipment is credited to the investment account and charged to the related reserve for depreciation.

Extraordinary retirements are recorded by this company by removing from the plant accounts the cost of the property retired and by charging the cost to profit or loss from plant and equipment retirements. This account is also credited with the accumulated depreciation and salvage realization. It is charged with the applicable dismantling costs. Sales (other than casual sales) of fixed assets are recorded in the same manner as extraordinary retirements, except that profit or loss from sales of fixed assets is the account used.

The policies and procedures of this company have been cited in this report because they appear to be the exception rather than the rule among oil producers. Most companies do not make as complete a distinction, so far as the accounting treatment is concerned, between different types of retirements. Some operators charge the reserve for depreciation with the cost of the unit

retired or sold. Loss on sale is charged to a special loss account. Other companies, primarily the smaller producers, nearly always credit the plant accounts at cost and debit the depreciation reserve accounts for accumulated depreciation, recording loss on retirement or on sale in special profit and loss accounts.

A Picture of Over-all Progress in Oil Industry Accounting

Many other matters concerning accounting policies for drilling and production costs for oil producers could be reported on and perhaps should be in this paper, to make it complete. Some of these topics are: cost accounting, administrative and general expense, depletion, and depreciation. On the other hand, it can be contended that these are somewhat specialized topics, especially the cost accounting and depletion, both of which could be the subject of separate papers in themselves. That is why they are omitted here. Further, the research project here reported on is still in progress, and certainly there is much analysis, evaluation, and interpretation of data already collected which will have to be done.

Nevertheless, it seems clear that accounting for oil producers has come a long, long way from the admitted backward state of years ago. There are still deficiencies, but probably not much more so than in other industries. Neither is there complete uniformity of accounting treatment in most areas, but, again, it can be strongly argued that complete uniformity is not essential or the ultimate goal of sound accounting. Although it can be admitted that accounting applications for oil producing companies are not as scientific as for production techniques, and perhaps never will be, this circumstance is not peculiar to the oil industry alone. Great improvement in accounting policy formation and techniques has been made in the past two decades and continued improvement is the forecast for the future, especially in view of the general acceptance of electronic data processing by the oil industry.

Drilling and Development Costs of Oil and Gas Wells—Accounting and Tax Problems

by PRESLEY FORD, JR.

Partner, Haskins & Sells, Tulsa, Oklahoma

The make-up of oil and gas well intangible drilling and development costs is presented in this article, as well as risk-spreading ownership arrangements—all in the light of the elections which the Internal Revenue Code offers with respect to the capitalization or deductibility of these costs. An enumeration of the many differences between financial accounting and taxable income of oil companies is given at the close in connection with discussion of the effect of the portion of the difference attributable to treatments of development costs.

THE DRILLING OF OIL and gas wells gives rise to an interesting series of accounting problems for which petroleum accountants have been called upon to devise solutions. An understanding of the alternative methods of accounting for intangible drilling and development costs is essential to the understanding of financial statements issued by oil companies as well as to the understanding of the methods by which taxable income from oil and gas properties is determined.

Significance of Development Costs and What They Include

Intangible drilling and development costs, which are more commonly referred to as development costs, represent expenditures made to sink a hole in the earth's crust to reach a reservoir of oil or gas. Development costs are to be distinguished from leasehold costs, which represent bonuses paid, and other costs incurred to obtain the right to exploit the oil and gas reserves. They are to be distinguished also from the cost of well and lease equipment installed on the property for the purpose of producing oil or gas. Development costs are likewise to be distinguished from the purchase price of reserves on which the development has already occurred, which is generally classified as leasehold cost.

A more technical definition of the term, "development costs", is to be found in the Federal income tax regulations. Under these regulations and the Internal Revenue Code, each taxpayer is granted an election with respect to such costs. A taxpayer may elect to capitalize development costs or to deduct them from taxable income in the taxable year in which paid or accrued (depending on the

method of accounting used). If the taxpayer elects to capitalize development costs, he is entitled to a second election which permits him to deduct the development costs of dry holes. The election with respect to development costs must be made by the taxpayer in his return for the first year in which such costs are paid or accrued, and the election with respect to dry holes must be made in the first year in which such a well is completed. The elections so made are irrevocable. Because of the importance of these elections, accounting for development costs in the books of account is in many respects based on the income tax regulations and the related rulings and decisions. Any comprehensive discussion of accounting for development costs must, therefore, include a consideration of both the financial accounting and the income tax aspects of the subject.

The regulations generally define development costs as expenditures which are "incident to and necessary for the drilling of wells and the preparation of wells for the production of oil or gas", and which "in themselves do not represent items which have a salvage value". A partial list of items which may be included in development costs follows:

I Preparatory costs:
1. Geological and geophysical work in selection of well site (to be distinguished from geological and geophysical work in connection with acquisition of or evaluation of acreage).
2. Surveying and staking the well location.
3. Clearing and grading the well location.
4. Building roads and bridges to move drilling equipment to well location.
5. Installing temporary lines, tanks, etc., for water or fuel to be used in drilling.
6. Moving drilling equipment to the well site.
7. Erecting drilling equipment.
8. Building temporary racks for drill pipe, casing, and tubing.
9. Digging slush pits.

II Drilling costs:
1. Labor (and related taxes and insurance).
2. Drilling supplies.
3. Maintenance and repairs of drilling equipment.
4. Bits and reamers.
5. Fuel, power, and water.
6. Mud and chemicals.
7. Depreciation of drilling equipment.
8. Overhead applicable to drilling operations.

III Completion costs:
1. Well surveys and testing.
2. Cementing surface casing.
3. Shooting, acidizing, casing, perforating, etc.
4. Cores, samples, etc.
5. Transportation of casing, tubing, and other sub-surface equipment to well location.
6. Installation of casing, tubing, and other sub-surface equipment in hole.

IV Late charges:
1. Dismantling drilling equipment and clearing location.
2. Filling slush pits and grading location.
3. Damages to landowner's property.
4. Plugging the well (if a dry hole).

It should be borne in mind that, in most instances, oil and gas wells are drilled by independent contractors whose services are furnished at a flat rate per foot of hole drilled plus a day-work charge for time spent in testing, etc. Well surveys, cementing, acidizing, and similiar services also are usually furnished by independent contractors. In some instances, wells are drilled and equipped

under turnkey contracts. Here the well is drilled and equipped by the contractor for a lump sum. In such situations the portion of the total contract price allocable to intangibles, as compared with tangible equipment, is subject to the development costs option.

The income tax option with respect to treatment of development costs applies not only to the cost of drilling wells but to workover jobs in which existing wells are deepened or plugged back to a shallower formation. Further, the cost of drilling wells to provide water for drilling operations is generally considered to be covered by the option. There is one decision which lends support to the position that input wells drilled for the purpose of injecting water into the oil-producing sand to increase production in water flooding projects are within the option. Salt water disposal wells and water supply wells drilled in connection with lease operations are not accepted by the Internal Revenue Service as being covered by the option.

Development costs are to be distinguished from installation costs of surface equipment. The applicable regulation states that the "option applies only to those drilling and developing items which in themselves do not have a salvage value". Thus, casing and tubing are equipment and not development costs. The regulation, however, provides that, "for the purposes of this option, labor, fuel, repairs, hauling, supplies, etc. are not considered as having a salvage value, even though used in connection with the installation of physical property which has a salvage value". Accordingly, the costs of hauling, labor, cement, etc. used in the installation of sub-surface equipment are classified as development costs.

The Internal Revenue Service, has taken the position that the option ceases to apply to installation costs when the Christmas tree (valves, fittings, and connections) has been installed on the top of the casing. It has held that installation costs of pipe lines, tanks, separators, salt water disposal equipment, and the like are not development costs because they relate to lease equipment and are not necessary for drilling or the preparation of wells for the production of oil or gas.

Spreading Risk of Development as Related to the Tax Option

Because of the financial risks which are involved in the drilling of oil and gas wells, joint operations are common in the petroleum industry. Drilling and development are the obligation of the owners of the operating (working) interest, as contrasted with the owners of royalty, overriding royalty (an additional royalty carved out of the working interest), or production payment interests (an amount of money or quantity of oil or gas payable solely from oil or gas produced). These latter interests are not burdened with such obligations. The

income tax options with respect to treatment of development costs are available only to the co-owners of the working interest, that is, the owners of the operating rights. A great variety of arrangements for spreading the financial risks have been devised. Some of the more common arrangements are briefly discussed in the paragraphs which follow.

The most common of these is the joint operating agreement. As an illustration, assume that A owns the entire working interest in a lease. He sells 37½ per cent to B and 12½ per cent to C. A is designated as operator. B and C are referred to as non-operating co-owners. A undertakes to develop the property. All expenditures made by him are charged to the joint account and monthly billings are rendered to B and C for their 37½ per cent and 12½ per cent of the charges, respectively. Such an arrangement ordinarily provides that each co-owner may take his share of the production in kind and traditionally has not been regarded as a partnership for Federal income tax purposes. Under the 1954 Internal Revenue Code and related regulations partnership classification may be avoided by filing a partnership return containing a copy of the joint operating agreement and an election not to be subject to the partnership provisions of the Code. Under the arrangement just described, each co-owner may record his share of the development costs in accordance with his established accounting policies. One might use the cash basis and another might use the accrual basis. One might capitalize and another might write off development costs.

A second type of arrangement is the farm-out agreement. As an illustration, assume that A owns the working interest. He assigns 50 per cent to B upon the latter's agreement to drill the first well free of cost to A. In such a case, 50 per cent of B's development costs would be subject to the option relating to deductibility or capitalization of development costs, whereas the remaining 50 per cent would be capitalized and regarded as leasehold cost to him. A would not be regarded as the recipient of income in this arrangement and no development costs of the obligation well would appear on his books. The leasehold is regarded as a pool of capital to which A has contributed his investment in the undeveloped lease whereas B has contributed the cost of drilling a well.

A variation of the farm-out arrangement would also involve the assignment to B of an interest in leaseholds other than the one on which the drill site was located. In this situation, some advocate the allocation of B's development costs among the properties based on their fair market value prior to the drilling of the well. In the illustration given, the development costs allocable to the drill site would be subject to the tax option to the extent of 50 per cent. Others regard the development costs as attributable only to the drill site and suggest

that the fair market value of the other leases be recorded as income received by B.

Somewhat similar to the farm-out arrangement is the plan whereby A would sell 50 per cent of the working interest to B for cash. At the same time A would agree to drill the first well and B's 50 per cent of these costs would be fixed in advance at an agreed amount. If this amount was substantially in excess of the development costs and related overhead incurred by A with respect to B's 50 per cent interest, the Internal Revenue Service would probably take the position that a portion of B's payment equal to the excess represented leasehold cost and would not be subject to option.

Another arrangement is the carried interest. To illustrate, A assigns the entire working interest to B who undertakes to develop and operate the property free of cost to A. It is agreed that, when and if the accumulated income from the property has equalled the costs expended by B, a 50 per cent interest will revert to A, who thereafter will participate in the income and pay his share of costs incurred. Although an early decision holds that, in certain carried interest agreements, the carried party (A) would be taxed on the income and entitled to the development costs deduction with respect to the 50 per cent carried interest, it now appears that a carried interest arrangement of the type described in the foregoing illustration is distinguishable from this case and that the Internal Revenue Service would, in such cases attribute all income and deductions to B during the pay-out period. A would have no investment in development costs incurred during the pay-out period.

Another arrangement is called the net profit interest. As an example, assume that A assigns the entire working interest to B with the agreement that he would receive 50 per cent of the net income from the property payable solely from the proceeds of oil or gas when and if produced. In this situation, A's leasehold cost becomes his investment in the net profits interest. All development costs are incurred by B and may be capitalized or deducted for tax purposes as he elects (but irrevocably). His net profit payments, if any, to A serve to reduce his gross income from the property because they are in the nature of royalties.

Risk-sharing arrangements are not necessarily limited to co-owners of the oil and gas leasehold. The owner of a leasehold who proposes to drill a wildcat well, that is, a well in an unproven area, may obtain contributions from owners of surrounding leases, the value of whose properties will tend to be proved or disproved by the well. Dry hole contributions are made only if the wildcat well is dry. Bottom whole contributions are made upon reaching the agreed depth of the well, whether it is a producer or a dry hole. Contributions may

be made in cash or in undeveloped acreage. In either event, the contribution is a reduction of the driller's development costs or an item of income to him. Dry hole contributions are deductible by the contributor. Bottom hole contributions are required to be capitalized if the well is productive, as an addition to leasehold cost.

Another arrangement involves the use of a payment solely from oil or gas when, as, and if produced. To illustrate, A owns the working interest in a lease. B, an independent drilling contractor, undertakes to drill a well on the lease. He is to receive a production payment of agreed amount (in dollars or in quantity of product) as compensation for his services. Under this arrangement, A has no development costs nor is he considered to be in receipt of income. B's drilling costs are not subject to the development costs option because he is not the owner of an operating interest but are to be capitalized as his depletable investment in the production payment received. If both cash and a production payment are received, B must allocate his drilling costs between the cash and the production payment based on fair market value.

Charging Development for Operator's Equipment and for Overhead

As has been previously stated, most wells are drilled and many related services are furnished by independent contractors. In instances in which the well is drilled or services are furnished by the operator of the property, additional accounting problems arise. Joint operating agreements with respect to oil and gas properties ordinarily permit the operator to charge the joint account for services rendered and facilities used at the prevailing rate for these services and equipment in the locality. As a consequence, when a well is drilled by the operator, he stands somewhat in the position of an independent contractor. Development costs are charged to the joint account and drilling income is credited at the rate per foot and per day which an independent contractor would charge. The actual cost of drilling is charged to appropriate contract drilling cost accounts. The operator's profit or loss on the well is usually regarded as a profit or loss from drilling operations. However, his share of the charges to the joint account properly may be reduced or increased to actual cost, if desired. Accounting for the use of the operator's automobile, trucks, spudders, etc. is made in similar fashion, using rates per mile, per hour, or per day equivalent to the rates charged by independent contractors.

General and administrative overhead is ordinarily included in development costs in the books only to the extent of the fixed charge per month per well, which is ordinarily provided for in joint operating agreements among the co-

owners of oil and gas properties. For the purpose of computing the tax allowance for depletion based on a percentage of income, an allocation is made of the general and administrative expenses applicable to drilling and development activities (either separately or as part of overhead applicable to all production activities). The income tax regulations prescribe that the allocation to drilling and development activities shall be based on the ratio of the direct operating expenses of the various types of business activities carried on by the taxpayer and the overhead allocable to drilling and development activities is in turn to be allocated to specific properties, taking into account their relative production. Other equitable methods have been accepted by the Internal Revenue Service, one being the allocation of drilling and development overhead to specific properties based on direct development costs incurred.

District expense, which represents the salaries and expenses of personnel supervising or serving a group of leases in a given geographical area, is ordinarily allocated to individual properties in the books and for the purpose of billing non-operating co-owners. A commonly used basis for this allocation is the number of wells in the district. To give recognition to the fact that the drilling of a well requires more activity on the part of district equipment and personnel than does the operation of a producing well, a drilling well is weighted at, say, the equivalent of four producing wells in making the monthly district expense allocation.

Financial Statement Treatment of Development Costs

For purposes of financial reporting, as contrasted with accounting for income tax purposes, three practices with respect to development costs appear to be in general use. The lack of uniformity in this respect is probably attributable to the influence of long-established income tax accounting concepts on financial accounting and the natural conservatism of companies the operations of which involve high degree of financial risk.

A survey of the published reports of major oil companies indicates that the great majority of such companies capitalize the intangible drilling and development costs of productive wells and recover them through depletion or amortizations charges. Considering the nature of development costs, the benefits of which extend over the productive life of the well, this is unquestionably the preferred treatment. However, a few of the major companies capitalize development costs of productive wells and immediately provide a reserve equal to this amount, with the result that the costs are charged against income in the year in which paid or accrued. This method is conservative but is subject to

the theoretical objection that development costs are not matched against the revenue derived from the well.

Among the smaller companies, partnerships, and individuals, there is a strong tendency to charge development costs directly against income in the year in which they are paid or accrued. This method, likewise, is subject to the theoretical objection that there is not a proper matching of costs against revenues. It is subject to the further objection that the balance sheet does not disclose the accumulated investment in development costs. Proponents of this method cite the arguments of conservatism, of conformity to income tax accounting, and the fact that balance sheet values based on cost rarely bear any relation to fair market values of property in the petroleum industry.

Development costs of dry holes are generally charged to income as paid or accrued, although the cost of dry holes drilled on producing properties is capitalized by some companies.

In view of the alternative methods of accounting for development costs which are in general use, the reader of oil company financial statements should give careful attention to the method used in the statement before him. Where development costs are not capitalized and amortized over the productive life of the property, the following should be taken into account in making comparisons with statements in which the preferred method is used:

1. Income tends to be depressed in the early years of a property's life when drilling and development expenditures occur. In a growing company this tendency will be reflected in the income statement during the growth period. When development slows down or ceases, a tendency toward overstatement of earnings appears.
2. Income for any given year may be increased or decreased by reasons of the management's decisions as to the extent of the drilling program to be carried on during the period.
3. Where sales of the properties occur relatively early in their productive life, the gains are usually materially greater or the losses are materially less than would be the case if development costs were capitalized and amortized over the life of the properties.

Among the companies which capitalize development costs, at least two alternative methods of amortization appear to be in general use (in addition to 100% amortization in the year in which paid or accrued as previously described).

Under the unit-of-recovery method, the estimated recoverable reserves of oil or gas to be obtained from the completed wells on each property are divided into the accumulated development costs on the property to provide a unit rate which is multiplied by the quantities of oil or gas recovered during the year to arrive at the amortization for the period. Estimates of recoverable reserves are revised at periodic intervals, based on the actual experience with the property. Ordinarily these revisions are retroactive only to the beginning of the year of the change.

In some instances, development costs are amortized by the straight-line method, using rates comparable to those used in the depreciation of leasehold equipment.

The Federal income tax regulations require that capitalized development costs be recovered through depletion except for the portion of development costs which represents the installation costs of equipment, which portion is recoverable through depreciation.

Treatment of Tax Effect of Development Deductions Not Booked

A common practice in the petroleum industry is to capitalize development costs for purposes of financial reporting and to deduct these costs in the year incurred for Federal income tax purposes. In this situation the theorist will ask if provision is made in the year the well is drilled to cover income taxes which will be paid in future years when the financial provision for amortization of development costs does not have a corresponding income tax deduction. A provision for deferred income taxes or for additional amortization equal to such taxes is not ordinarily made.

If an enterprise drilled only one well or developed only one lease, failure to provide for deferred income taxes would undoubtedly result in an overstatement of income in the year in which the drilling occurred and taxes were reduced by the deduction for development costs and would produce an understatement of income in all future years when the amortization of development costs on the books produced no income tax deduction. This, however, is a situation which rarely prevails in the petroleum industry. The continuous need for the discovery of underground reserves to replace those being depleted by production leads most producing companies to engage in annual programs of drilling and development throughout the life of the enterprise. As a result, petroleum accountants are inclined to regard the development costs deduction as one of those "differences between the tax return and the income statement" which "will recur regularly over a comparatively long period of time" and which are exempted from the application of the deferred taxes provision by the terms "Restatement and Revision of Accounting Research Bulletins", page 87 (American Institute of Accountants).

This thinking of petroleum accountants is undoubtedly conditioned by the fact that, in a producing oil company, there are numerous and important differences between commercial net income and taxable net income. The analyst finds that the provision for taxes bears no fixed relationship to income as reported in the financial statements and the effective tax rate for future years is a matter

of conjecture. Delay rentals on undeveloped leaseholds may be capitalized for financial reporting purposes and they are almost invariably expensed for tax purposes. Geological and geophysical expenditures must be capitalized for tax purposes where acreage is acquired or retained and these costs are often expensed in their entirety in the books of account. Undeveloped leasehold costs may be amortized in the books, but this is not permissable for tax purposes. Income from the sale of production payments is reported in the year of sale for tax purposes and may be deferred over the period of production in the books. Percentage depletion, a tax deduction the amount of which is greatly influenced by the amount of development costs expended on the property during the year, differs materially from the provision for depletion which is ordinarily recorded in the books. Faced with this multiplicity of recurring differences between commercial and taxable income, the petroleum accountant is not inclined to single out development costs for special treatment.

At least one major company, however, has recognized that the development cost deduction may produce a distortion in income despite the recurring character of the difference between commercial and income tax accounting. In its 1951 report to stockholders The Texas Company included the following note:

> "Since 1934, the Company has capitalized the costs of drilling productive wells and has amortized such costs by charges to the income account on a straight line basis, except in Illinois, Indiana and Kentucky, where the costs are fully amortized as incurred. For Federal income tax purposes, however, the Company continued to deduct all intangible drilling costs in the year incurred. As a result there is an immediate tax deduction for drilling costs capitalized in the current year which costs will be amortized by charges to income in future years. This affects the income account in a way which becomes more significant in periods like the present one in which there are heavy drilling activities and very high taxes.
>
> "In recognition of this situation, the Company, beginning in 1951, has adopted the policy of providing an additional reserve for amortization of intangible development costs equivalent to the reduction in taxes applicable to the excess of current drilling costs incurred over regular amortization charges. In 1951, such additional amortization amounted to $13,680,796."

Although this report was published several years ago, the writer has not observed instances in which other companies have adopted the practice just described. This merely serves to emphasize what has previously been stated, namely, that the alternative methods of accounting for development costs which are used within the petroleum industry are such that the reader of financial statements issued by oil companies should take note of the practices employed in any set of statements, in making comparisons between companies.

The Control of Development Costs

In conclusion a word on the control of development costs may be helpful.

In many oil companies drilling of oil and gas wells is conducted under an annual capital expenditures budget which defines the aggregate amount to be expended for development costs during the period. The budgeted amount may be broken down according to geographical areas, monthly or quarterly periods, etc.

When the drilling of a specific well is planned, it is the better practice to issue a properly-approved authorization for expenditure describing the well to be drilled and including an itemized estimate of the costs to be incurred. Competitive bids are obtained for drilling and other major services. Actual development costs are accumulated by authorizations for expenditures and by appropriate sub-classifications so that variations over and under the preliminary estimates may be noted and investigated for report to management upon completion of the well. Such records also form a basis for future estimates and comparisons.

Where the authorization for expenditure system is used, wells in progress at the balance sheet date will appear as an asset similar to construction in progress. For Federal income tax purposes, however, development costs are to be deducted (if the taxpayer has so elected) in the year in which the costs are paid or accrued, even though the well is not completed. Advance payments to contractors are not deductible where the drilling has not been performed.

What Makes Up An Adequate Records Program?

by WILLIAM BENEDON

Records Management Advisor, Lockheed Aircraft Corporation, Burbank, California

Seven principal reasons for conducting a full-scale records program form the starting point of this article, the twin emphases of which are economy of records maintenance and making the records most useful through serviceable reference. Forms structually important to a records review and to continuing records control are given in illustration. The operation of a records center is explained. Microfilming and protective storage are among the topics discussed.

INDUSTRY AND GOVERNMENT are rapidly becoming aware of the savings and efficiency which result from sound records programming. This fact is best borne out by the numerous government agency and company surveys currently being reported in newspapers and magazine articles. The success and related accomplishments of these surveys has been due to the application of definite procedures to the review of existing practices and the installation of proven techniques for proper records control and maintenance. A company's record program should be subjected to a periodic review to determine the effectiveness of such a program and to make the necessary changes or refinements to assure its continued operation. In considering this review, management should ask itself the following questions:

1. Do we have an organized system for the continuous control of records creation and flow? If not, we need to develop a records retention schedule as a basic document.
2. Are we maintaining our required records in the most economical and efficient manner? Consider what a records center will do before deciding on the answer to this question.
3. What use are we making of microfilm? Is it the most effective use?
4. Do we have an "operations reconstruction plan?" If not, we would be well-advised to think over a special vital records program for disaster protection.
5. Are we providing the best means for controlling correspondence and reports through our records schedules?
6. Are we preserving our "company memory"? At least, the information for a company history should be retained.
7. Have we the proper written procedures and lines of communication for the understanding of our company purpose? A program not in writing is on dangerous ground.

A detailed discussion of these questions is not the intent of this article. The importance of each justifies greater coverage. The purpose here is to describe briefly some of the techniques which have provided affirmative answers to each of these questions in turn. Consider them carefully and then weigh them in respect to your own company.

RECORDS RETENTION SCHEDULE
Effective Date: 1-5-56

Department: Payroll		Dept. No. 81-24	Section/Unit: Payroll		Schedule No. A-45
Item No.	Record Title	Form or Report No.	Retention Schedule Office	Center	Destroy
1	Accounts Receivable Cards-Employees	DX5814	12 mo.		12 mo.
2	Address Card - Employee	5904	A		*
3	Adjustments - Gross Earnings	DX4552	4		4
4	Adjustments to Labor Distribution	2586	12 mo.	10	10
5	Affidavit and Request for Sick Leave Pay	1154	12 mo.	10	10
6	Attendance Certificates	5607	4		4
7	Audits - Georgia Billings	NFN	1		1
8	Authorization to Approve Time Card Irregularities	5215	A		Obs. **
9	Authorization/Payroll Adjustment-Hourly	ANVO	1	9	10

*Kept until Term. and tax info. returns mailed out
**When job class is changed or employee terminates

An explanation of the symbols used to designate retention periods accompanies each schedule. All numbers indicate years in addition to the current year. "A"- Active office use. "Obs". - Obsolete. "Mo." - Number of months record is kept. The schedule indicates how long the record is kept in the office before transfer to the Records Center. Center indicates how long the record is kept in storage, and Destroy indicates the total life of the document. If Center is blank, the record is destroyed directly from the office. A control card is maintained in the Center for Items 4, 5, and 9. There are a total of 160 items on the Payroll schedule. This includes Tabulating Reports and Management Reports. Forty-five of these items are sent to storage.

Schedule Numbers are prefixed by letters to indicate area of operation as follows: A - Administrative Departments. M - Manufacturing. S - Sales. E - Engineering. FO - Flight Operations. MS - Master Scheduling. COR - Corporate. The effective date is the date departments indicated they were ready to operate in accordance with the schedules.

In use, the form also contains a remarks column at extreme right.

EXHIBIT 1

Developing the Records Retention Schedule

The most effective means for controlling the flow of records from active office use to final disposition or preservation is the *records retention schedule*. Such schedules are designed for and applied to each department within an organization and contain an alphabetical listing of all records series processed or retained by each department. Exhibit 1 is an example. Records series are groups of related records which are normally used and filed as a unit and which permit evaluation as a unit for disposition purposes.

Further refinement of a retention schedule may include form numbers contained in each series, as well as some explanatory remarks concerning the file function. The use of form numbers is very helpful in coordinating the schedule with a systems or forms control unit. Requests for new

forms may contain as reference the retention schedule and item number under which it is to be filed, thus providing retention information. If a record is to be filed independently, it means that a new item must be added to the schedule.

However, although forms control has its impact at the creation of records, its emphasis is on individual forms design and construction and not on files accumulations. We must begin our work with the files accumulations which confront us. They serve best as the starting point for a records survey to develop a retention schedule. The preliminary workpapers and forms used may vary, but the most desirable procedures involves three phases of action: a physical inventory of all company records in both storage and active office areas, an appraisal of these records for the purpose of determining their retention value, and the approval of these records retention periods by operating and administrative personnel.

The physical inventory of records is the foundation for proper schedule development. Other means, such as questionnaires are not nearly as successful. Let us consider a possible pattern for such a survey. A separate worksheet is prepared for each record series as in Exhibit 2. When the inventory is complete, the worksheets are consolidated and placed in alphabetical sequence by department.

An appraisal and approval card is then prepared for each series. Exhibit 3 is representative. There are many factors involved in the proper evaluation of records, both internal and external. Internal factors include administrative or operational value of the record, historical value, and value from the standpoint of vital document protection. Decisions concerning these factors are based upon company experience and needs and can be determined from direct consultation with company

RECORDS INVENTORY WORK SHEET

Yrs.	Range	Area 61	Location	Equip.	Cu. Ft.	Action
55	A - Z	P/RV	1-H-13	C3x8	33	

DESCRIPTION: Internal Form Accumulates Deductions, Supplemental to Tab Run

COPY: Tab Card

RECORDS TITLE:	FORM NO.	DEPARTMENT:
Accounts Receivable Cards-Employees	DX5814	81-24 Payroll

EXHIBIT 2

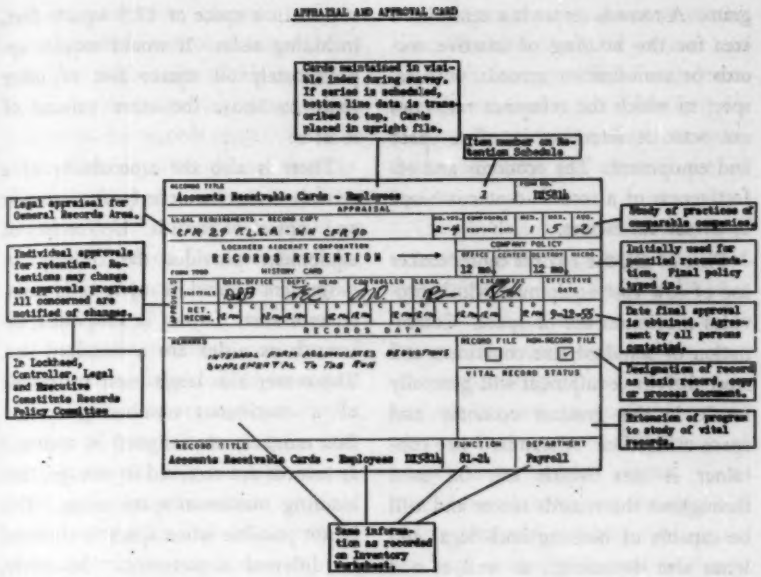

APPRAISAL AND APPROVAL CARD
Cards maintained in visible index during survey. If series is scheduled, bottom line data is transcribed to top. Cards placed in upright file.
Item number on Retention Schedule
Legal appraisal for General Records Area.
Individual approvals for retention. Notations may change as approvals progress. All concerned are notified of changes.
In Lockheed, Controller, Legal and Executive Constitute Records Policy Committee
Study of practices of comparable companies.
Initially used for pencilled recommendation. Final policy typed in.
Date final approval is obtained. Agreement by all persons concerned.
Designation of record as basic record, copy or process document.
Extension of program to study of vital records.
Same information as recorded on Inventory Worksheet.
Accounts Receivable Cards - Employees
CFR 29 FLSA - WH CFR 40
RECORDS RETENTION
12 mo.
9-12-55
Payroll

EXHIBIT 3

personnel. External factors include federal, state, and local legal requirements and comparable company data. Legal evaluations present the most difficult phase of records analysis and require considerable research and investigation. Two recent publications provide assistance in this area and are worth noting.[1] Although neither of these reports is meant to be the final authority on retention citations, each provides a helpful insight toward better understanding of a company's particular area of concern on the legal side of the question.

The form embodied in Exhibit 3, as indicated, is also used to obtain approvals. Data from the card are then transcribed to the records retention schedule form. Schedules are often rerouted to departments before final publication to assure proper interpretation of retention periods and use of terminology.

The Function and Advantages of A Records Center

Records maintenance based upon the principles of records center operations provides the best method for keeping records required under a records pro-

[1] Index to Federal Record Keeping Requirements, (NewYork Technical Information Service, National Records Management Council, 1955, p. 32); Guide to Records Retention Requirement, Title 1, Appendix A—Code of Federal Regulations. (Washington, Federal Register Division, General Services Administration, Friday, April 8, 1955, pp. 2217-2273.)

gram. A records center is a centralized area for the housing of inactive records or semi-inactive records, with respect to which the reference rate does not warrant retention in office space and equipment. The economy and effectiveness of a records center is based upon several factors.

First of all, the records center makes use of low cost equipment which provides maximum use of space. Combination of standard size containers and steel shelving equipment will generally result in the greatest economy and space utilization. A standard size container is one which can be used throughout the records center and will be capable of housing both legal and letter size documents, as well as odd size documents and cards. Exceptions such as bound volumes and tabulating cards require special consideration under any method of storage. The best container is one which measures 10 inches in height, 12 inches in width, and 15 inches in depth. The 12 inch width serves letter-size materials and the 15 inch width legal-size materials. Shelving should measure 42 inch wide by 30 inch deep. This provides for three boxes side by side on the 42 inch side and two deep on the 30 inch side. For practical purposes, enough space is allowed to place 12 boxes on each shelf. This is accomplished by placing the shelves on 23 inch centers. A shelving unit using uprights measuring 118 inches and containing 6 shelves can house 72 standard records containers in a space of 17.5 square feet, including aisles. It would require approximately 60 square feet of office space to house the same volume of records.

There is also the amenability of a records center to orderly arrangement and control of records. Uniformity of equipment provides the orderly arrangement desired in any records maintenance area. Layout is simplified, inasmuch as aisles are a standard size. The center also lends itself to the use of a continuous numbering system. Box numbers are assigned in sequence as records are received in storage, thus assuring maximum space usage. This is not possible when space is allocated to different departments. Moreover, labels are not needed on the containers, because box contents are recorded on a control index—preferably a visible index. As already noted, a card is maintained for each item on the retention schedule which is destined for storage as well as its retention period. For each box received, a posting is made to the card indicating the date of the records covered, their range, and the box number. Space is also provided to record the date and authority for actual destruction.

Further, with a records center, it is practicable to employ procedures which assure prompt and efficient handling of records. The system of continuous numbering and card index control simplifies and speeds records servicing. The use of identical terminology on

both the retention schedule and the records center's control card contributes greatly to the benefits of this operation. Good service results in increased confidence in the records center, with the result that departments are less inclined to keep semi-active records in the office area. Reference analyses are maintained, which form the basis for periodic audit of retention periods. The existence of records center assures conformity to retention periods and destruction is completed on an annual basis. Procedures are uniform for the transfer of materials to storage, inasmuch as there is only one type of container and the information required on the transfer list follows the outline of the center's control card.

There are also two outstanding cost-saving benefits implicit in having a records center. The steel shelving units and standard containers described, reduce storage equipment costs approximately 70 percent. A shelving unit including 60 containers averages $39. Other forms of storage equipment average $120 for the same volume of records. This difference in cost is even greater when the cost of released office equipment through scheduled transfers is considered. Then there is the matter of space. A records center layout is planned so as to obtain a ratio of between 4 and 5 cubic feet of storage per square foot of area. Most other storage areas average from .75 to 2 cubic feet. The total area provided for records divided into the cubic volume of records maintained gives this ratio. To obtain the cubic volume, 1.66 cubic feet is suggested for each letter-size drawer and 2.00 cubic feet for each legal size drawer. Exact measurements are used for other forms of equipment.

The physical layout and planning of a records center requires careful and extensive planning. Existing facilities may be modified to fit a new type of storage, an entirely new building may be constructed specifically for the purpose, or use may be made of a more adequate leased area or the services of a commercial records center. Commercial records centers as distinguished from commercial warehouse storage are buildings centrally located within a city to which several companies send their inactive records. They are designed on the principles mentioned previously and maintains a staff which provides all the processing, servicing, and disposal activities for the company. If such facilities are available to a company, they should be considered in reaching a decision on the location or type of records center desired.

Careful Consideration of the Applicability of Microfilming

Microfilm, or reduced-size photographic reproductions of records, has been adapted to three phases of paperwork operation; (1) reducing storage space and equipment requirements, (2) vital records protection and preservation and (3) speeding current ad-

ministrative procedures. The last two applications have received the most emphasis in recent years. Using microfilm as a space saving device is no longer the cheapest method to accomplish this goal. Proper evaluation of records most often results in the reduction of retention requirements. New duplicating processes preserve the records for a comparatively long period of time, thus avoiding the possible need to microfilm for preservation. The cost to microfilm a file drawer of records varies from $4.00 to $45.00. To house this quantity of records in a records center costs about $1.30 annually, including all necessary operating expenses. The decision of whether to film or store them involves a close analysis of the documents involved, their retention, filing format, volume, and available storage facilities. Most studies have shown that records which must be retained for a period of less than twelve years should not be microfilmed for the sole object of saving space.

Nevertheless, microfilming is highly important in record protection. Data in a collection of irreplaceable records can be secured against loss by fire, flood, or other causes by making and depositing a microfilm copy in a location other than that housing the original record. Valuable original records subject to deterioration from age or frequent usage can best be preserved by utilizing a microfilm copy for reference purposes. Microfilm usually plays a heavy role at the inception of a vital records program in order to bring required document protection up to a current basis. The day-to-day operation of a vital records program, however, does not necessarily involve extensive microfilming. In addition to rotary and planetary office models, there is portable microfilm equipment which has been successfully adapted to the extension of a company's vital records program to divisions or branch offices. With such equipment, periodic visits can be made to these areas to record constantly active valuable records (price cards, ledgers, reports, etc.) and the microfilm copies can then be sent to a central protection area or the home office.

In the area of administrative procedures, microfilm can be used to eliminate or greatly reduce the clerical labor normally required for the transcribing of information. It also serves to expedite certain office operations by making record data more readily accessible for reference and use. An example of this occurs where documents pass through an office or are held only temporarily but contain information required for control purposes or for later file reference. The Federal government uses microfilm in the control of incoming mail. Several engineering and aircraft concerns provide the armed services with microfilm copies of blueprints and drawings. Formerly, these copies were reproduced by other means and were more costly. Such recent developments as sheet microfilm,

microcards, microprint and filmsort have increased the area for possible microfilm usage. Sorting and selection of microfilm records by mechanical means is possible through the insertion of microfilm frames on cards developed by Keysort, IBM, and Remington Rand.

Further improvements in the field of microphotography are being attempted with electronic equipment. As an extension of the microfilm-punch card system, Eastman Kodak is currently testing the Minicard, which offers greater condensation of information and faster manipulation. As part of its program of industrial TV, RCA has adapted the use of microfilm to television. In principle, this involves the transmission of microfilm via television to a receiving point where the microfilm is automatically reproduced. Similar in some respects to zerography, its Electrofax equipment, without the use of plates, transmits an image to zinc-oxide coated paper from filmsort or roll film. In connection with an electronic data processing system, International Telemetering Corporation has developed a photoscopic-storage technique. At an extremely high reduction ratio digitally coded information is printed on a photoscopic disc. It is played back via a photoelectric pickup. These methods, at present, are still somewhat experimental, but there is little doubt that their further improvement and application will make them practical for many large-scale operations.

Microfilm is well established as a system for recording or duplicating records. It is, therefore, necessary to keep abreast of these many new developments. It is equally important that the principles of microfilming be clearly understood and that all data on the subject be considered. A publication of recent origin presents an excellent coverage of the subject. It was issued by the Department of the Army in August, 1955, and is entitled, *Microfilm of Records, TM 12-257.*

Protection through Vital Records Programming

Vital records are the documents which, if preserved, enable a business to reconstruct the past and resume normal operations after having been subjected to disaster. In addition, they provide the important means of substantiating claims against losses. A great deal of stress has been placed on the effects of nuclear explosions on business records. "Operation Teapot," the nuclear test held last year, proved conclusively that the damage to records could be considerable. Yet, the losses resulting from last year's Hurricane Diane on the East Coast and, more recently, the floods along the West Coast attest to an equally important menace. If a company intends to organize and implement a vital records program, then it must consider all the possible elements of disaster and the best means to counteract them.

All records cannot and need not be given special care and protection. It is then necessary, first, to determine and define what is meant by vital records, that is, what is the purpose of our program in terms of desired protection. Secondly, it is necessary to classify records in terms of their varying degrees of important. Finally, a decision must be reached upon the most efficient and economical way to provide protection and apply proper follow-ups. Each company must decide for itself the degree of coverage it desires. In classifying records, it must carefully analyze the relative importance of each type of record. Although the development of a complete records program is not necessarily a prerequisite to a vital records program, there is little doubt that the more comprehensive program can be very helpful in arriving at the proper decisions. A retention program and its related schedules will indicate the documents which have the most operating significance and will give some insight into the thinking of operating personnel on the records which they require. The classification of records might fall into the following pattern:

1. Records which cannot be replaced immediately after a disaster strikes and which will be required by law to continue the company as a legal entity.
   Examples: Certificates of incorporation, charters and franchises, minute books, leases, deeds, blueprints, drawings and stock records. These may be termed the *vital* records.
2. Records which have to do mainly with monies and, as such, would be required to substantiate claims to prevent or implement litigation or, possibly, to solve governmental probems.
   Examples: Fixed asset records, audits, tax reports, financial statements, major contracts, general ledgers, journal entries and insurance policies. These may be termed *valuable records.*
3. Records which would help to prevent delay or confusion after a disaster strikes but which are not essential to effect reconstruction of business activity.
   Examples: Personnel records, receiving and shipping documents, cancelled checks, trial balances, purchase orders, cost studies and mailing lists. These may be termed *important* records.
4. Records not falling into classifications 1, 2 or 3 may be termed non-essential records. They do not require special consideration under a vital records protection program.

The third and most important phase of the vital records program is to determine the best method, from the standpoint of efficiency and economy, with which to protect the records. There are four principal methods by which a company can accomplish this phase:

1. Dispersal
   a. Built-in dispersal—Geographic location and organizational structure provide necessary protection through the availability of the same document at various locations within the company. This is the least costly of all the methods of protection, inasmuch as it does not require further action on the part of the company in preparing or providing for new documents.
   b. Improvised dispersal—Usually involves minor changes in procedure under which copies may be released as a protective measure. The released copy, in turn, can be given special protection or can be sent to a secure location.
2. Evacuation—Documents which are used infrequently are physically transferred to a secure location. Interim documents are then transferred and maintained until replaced by the originals.
3. Vaulting—Vaulting applies to the housing of records in vaults, safes or other protected areas on the premises, as diffe-

entiated from the maintenance of original or duplicate records as mentioned in the dispersal method. With the exception of areas subjected to total destruction, the use of vaults for storage may be adequate in most instances. Investigations after the Hiroshima blasting indicated that records in a vault only 400 yards from the blast were saved, although the vault itself was somewhat damaged.

4. Duplication—In this instance, documents are reproduced so that the duplicates become the security copy and may be moved to a remote location. This method is the most expensive and although at one time it constituted the major portion of protection programs, it is gradually being replaced by the more practical combination of one or more of the above methods.

In determining the proper facilities for the housing of a company's vital records, special thought should be given to the use of a vital records center. This term is used in referring to a suitable construction located at a determined safe distance from the main operating plant and serving to house paper or microfilm copies of a company's vital documents. Where should the vital records center be located? Inasmuch as the area can mean a bank vault as well as a company-owned or leased building, the distance may range from fifteen miles to fifteen hundred miles from the point of company operations. In the nuclear tests previously cited, records storage equipment and buildings were placed at varying distances from bomb zero point and the following areas set:

1. A area-zero to twelve miles.
2. B area-five to twenty miles.
3. C area-one to thirty miles.
4. D area-one and one-half to forty miles.

It was found that a reinforced concrete structure above ground suffered little if any damage in the D area. Underground structures were found to provide protection in the A and B areas. In a May 1955 edition of the Civil Defense Technical Bulletin issued by the Federal Civil Defense Administration, it was indicated that the dispersal of records to areas 35 or more miles from a possible target site is equally if not more practical than placing records in plant or company vaults. Such criteria indicate that a records protection area can be located closer to main operations and thus reduce operating and maintenance costs. This factor presents the possibility of a consolidation of inactive records and vital records in the same location. In this way, vital copies are replaced by their original counterpart when the originals are no longer required in the operating locations. Several organizations have found it advantageous to use commercial records protection offered by banks or by special purpose companies which have designed mountain retreats for this purpose.

Records protection policies should be analyzed very carefully. If not handled properly, a company can easily "go overboard" on its programming and spend more time, effort, and money than can possibly be of use. It is, therefore, advisable not to become too pessimistic as a result of the many reports and statements that have been made regarding disaster control. Vital

records programming is a form of insurance for which we must pay a premium in the form of proper protection and additional maintenance. It behooves a company to analyze carefully its records insurance policy and relative benefits before paying the premium involved.

Controlling Correspondence and Reports Through the Records Schedules

Two of the most challenging phases of records management are correspondence and reports control. A company may organize its correspondence control on a centralized, decentralized, or centralized-decentralized basis. The centralized system provides for a single-file unit to control correspondence as well as other special bulk items. It is used most frequently in smaller organizations but is also applicable to larger concerns when all operating units are in close proximity to the file location. Under a decentralized system, each department is responsible for maintaining and servicing its own records. Decentralized filing is often used in companies which consider a separate filing area to be an added expense or in larger companies which are widespread in plant layout or which have extensive technical, research, or in process files. In cases in which decentralized filing is necessary or desirable, it is still advisable to have centralized control. This control may be of an advisory nature or it may involve a complete service staff under a central or general files department. The centralized-decentralized system results in general files personnel operating the decentralized units but reporting to the general files department. Through this method, files are maintained near the operating department and have the additional advantages of technical assistance, standard procedures, and a larger pool of filing personnel. The type of files centralization employed is mainly determined by a company's size, volume of paper work, and nature of the activity in which it is engaged.

An appraisal of records should always include a determination of the retention periods for correspondence. If correspondence is filed by operating function, it is much simpler to set retentions, but the situation becomes more difficult when various types of correspondence are filed in a general subject file. Care should be taken in a system of centralized filing not to get involved in an over-mingling of materials. Isolated function files can be properly evaluated to set their retention in line with the documents related to their existence. General subject correspondence files entail considerable investigation and reference study. To assist in this investigation, the records center can provide the necessary reference analysis to support future decisions but, in doing so, it should also indicate the nature of any requests, the age of the document and, mainly, whether or not the data was found. A reference analysis which indicates only

me number of requests received is not really effective. The retention schedule is useful in preventing miscellaneous files from going to storage, because it places departmental general correspondence on an annual review basis. The central file unit servicing a department should be the only transfer agent for the department's records. In this respect, it becomes an important medium for the proper preparation and transfer of records to storage.

Reports should also be included in a retention schedule. Each department schedule should include a listing of all the reports it originates and the retention time for the control copy, whether it is filed by the department or whether it is handled by a central file unit. A card similar to that which has been illustrated in Exhibit 3 might be prepared for each report and on it recorded the data on format, purpose, distribution and retention value. In many organizations, there are report control units which are responsible for the proper handling of management reports and tabulating control units which are responsible for the handling of tabulation reports. All attempts should be made to incorporate in the findings of any records study, those of such control units, and the manuals which they issue. Setting retention periods for reports only partially serve our over-all purpose. In addition, existing reports procedures must be reviewed.

Preserving Company Memory Suggests the Importance of Historical Data

The economies of a records program are most evident in the areas of records reduction and the release of space and equipment. Other benefits stem from the preservation of records for purposes requiring reconstruction of past situations and for historical value. The evaluation and appraisal of records should include an analysis for these purposes and should enable a company to isolate applicable categories of records for further review and use. Many companies have uncovered valuable historical documents during the course of a records survey, especially during a physical inventory of file contents. Records can be identified as being of historical value by the persons conducting the survey or this determination can result from consultation with company personnel during the regular clearance sessions for retention approvals. It is not necessary to research such materials immediately after they are found. Until a definite course of action is approved regarding the company history, these records can be assembled and placed in one location in the records center.

The identification of records of historical value involves attention to the question of what records to keep indefinitely. A most important finding under an organized retention program is that less than five per cent of all records must be retained permanently. This includes records required for his-

torical purposes. Fears of "hidden cost" inherent in undertaking records appraisal projects can be allayed by mere mention of this. The records survey includes *all* records. A record may be defined in part, as "any paper, written or printed book, document or drawing, map or plan, photograph, microfilm, sound recording, or similar device," and each of these forms of documentation ought to be considered in preserving the memory of a company.

The purpose and format of and the responsibility for preparing a company history must be determined by management, based upon the benefits and coverage it expects to derive from such a publication. Among the values of writing a company history are those for public relations, educational and scholarly contributions, employee relations (internal and external), customer relations and technical value. Technical histories are usually based upon product development and advancement and are often directed at benefits to be derived from future research, cost evaluations, and supporting basis for tax litigation or patent claims. Equally important is the company-wide history which can be effective as an educational device and still serve as a popular presentation for employee and customer interest. This type of history presents a problem in that it is inclined to be "slanted" and subject to possible criticism from competitive sources. Many outstanding histories have been written for companies by educational or research organizations or by persons experienced in magazine or newspaper writing. Others have assigned the task of history writing to someone within the company. The principal expense is for talent and each method must be weighed accordingly.

Whether a company is planning a history at present or not, provision should be made under a records program to gather the materials which may be of possible value in compiling one. In this respect, the person assigned the responsibility for the records program must himself, be concerned about preserving company memory and, therefore, must preserve reference to related documents for future use.

Putting the Rules in Writing

It is imperative that proper communications be assured, prior to, during, and throughout a records survey. This can best be accomplished with directives, group sessions, and progress reports. Audio-visual aids should be used, wherever possible, when planning program selling and training. Regardless of the amount of advance program publicity, department and branch heads in the area of records management will appreciate a "program recapitulation" before an analysis of records and the setting of retention schedules. Visual aids in the form of letter size presenta-

tions are effective for this purpose. Materials of this nature are strictly internal and should be developed by the person or group heading the program. For group training, a company should also make use of films, slides, wall size charts and graphs, circulating material or blackboard activity. Many films are available which provide excellent training data for a records survey, as well as for continued interest and knowledge in the field. Many companies have developed their own visual aids and have used them very effectively. Some typical examples are Pacific Telephone and Telegraph Company, which has produced a film on its disaster control program, Bethlehem Steel Company, which has set up a series of slides on its records center operations, and Richfield Oil Company, which has published a pictorial booklet on the purpose and operation of its records center.

Definite written procedures should be made available to all operating departments, explaining the format and meaning of retention schedules, routing to be followed in effecting changes or deletions, and procedures for preparing and transfering records to storage. Records center personnel should have procedures for receiving, processing, servicing and destroying records. Committing any of these functions to memory or relying on sketchy outlines will result in costly program reviews. Written procedures can be checked periodically with operating people to make necessary changes or refinements to assure their continued success.

All Questions Should Be Answered — Satisfactorily

Possible review areas for a records program have been considered here by setting forth certain questions which management should ask itself. It is safe to say that few companies can give really satisfactory answers to all these questions. It is hoped that this brief yet pointed coverage of the various areas of records management will cause readers to look at their programs and develop them fully. A records program review should be an integral part of the company's regular audit program.

Our Experience with Installing a Job Evaluation Program

by RALPH L. MEYER

Assistant Treasurer, Iowa Power and Light Company, Des Moines, Iowa

Given here and well illustrated is a compact description of the steps required, from job analysis to job re-evaluation, in applying a job evaluation plan reflecting the adoption of full-fledged wage administration procedures by a public utility in the years following World War II. Separate plans were set up for clerical employees and for supervisory and administrative personnel.

A GOOD JOB EVALUATION program is probably the most important single factor in personnel administration. Numerous employee surveys have shown that reasonable pay and job recognition rank near the top in employee desires. If properly developed and administered, job evaluation will go a long way toward satisfying these basic needs. The following paragraphs will consist of a description of the job evaluation program being used by our company. It will explain how we developed it and some of the problems and pitfalls encountered. The program covers all non-union employees in our company, from clerical employees up to and including middle-management. It is best described as a systematic approach to the problems of wage rate determination. Actually, we have two plans, one for supervisory and administrative employees and one for clerical employees. Both plans are fundamentally alike but, of course, wage rates and other factors are different.

Why and How We Started on Job Evaluation

As late as 1951, we were still using a wage plan developed during World War II. Minimum, standard, and maximum rates were provided for some jobs while other jobs were on a single-rate basis. The company had grown tremendously since World War II and, with its growth, many new jobs were added and many existing jobs were revised. We had no formal basis for establishing the relative worth of these jobs, so this remained largely a matter of individual supervisory judgment. Quite naturally, the positions under aggressive supervisors were rated higher than equally important positions under less aggressive supervisors. Furthermore, the plan lacked flexibility in the rate of progression and recognition of superior performance. The outbreak of the Korean War and subsequent wage stabilization impressed upon us quite forcibly the inadequacy and inequities of our existing wage plan.

The responsibility for developing and coordinating our evaluation program was assigned to our personnel department. Its staff was assisted by a management committee and an outside person nsultant. We engaged the services of an outside consultant for several reasons. First, time was of the utmost importance, inasmuch as we were trying to get some relief from the Wage Stabilization Board. Second, we lacked an experienced staff for this type of work. Third, presumably the consultant would be free from any preconceived ideas about relative worth of jobs in our organization.

Our first step was to issue a letter from the president to each employee. In this letter, we briefly outlined our objectives, explaining that we were planning to set up a program which would provide "equal pay for equal work" as well as compare favorably with going rates in the area. The employees were assured that no one would receive a reduction in pay as a result of the study.

Obtaining Job Analyses

As might be surmised we began the survey with detailed analyses of every position. Each employee was given a questionnaire, illustrated by Exhibit 1, which asked for pertinent information concerning his job. We wanted to know his title, his duties, equipment used, customer contacts, and so on. We followed this up with a personal visit to each employee to make sure that all aspects of the job were considered. In addition to the questions on the questionnaire, we also asked for further information on educational requirements and experience necessary for the job, which duties the employee considered most important, working conditions, etc.

We reviewed with the respective supervisors the data received, to make sure that the positions were accurately described and particularly to prevent "blowing up" a job. This review with the supervisors had some very important by-products. We discovered duplication of work in some cases, misunderstandings between employees and supervisors as to job responsibilities and duties, and even misunderstandings between supervisors as to lines of authority and responsibility. In this connection it should be pointed out that it is extremely helpful to have an up-to-date organization chart which shows functional responsibilities as well as titles.

From all of the information gathered in the job analysis and review, we prepared job descriptions for each type of job. The Position Analysis Record, Exhibit 2, shows the job description for Supervisor Employee Training and Information, as it appears on the face of the form (the reverse is shown blank). A similar description was prepared for every other position. It will be noted that the contents of the form are quite simple, consisting primarily of identification and a listing of prin-

JOB DESCRIPTION QUESTIONNAIRE

1_____ 2_____ 3_____ 4_____
Employee's Name Age No. Years on Job Department You Work In

5_____ 6_____ 7_____
Division You Work In Section You Work In Present Job Title

8_____ 9_____ 10_____
Name of Your Supervisor Your Supervisor's Job Title No. Work Days/Week

11_____ 12_____ 13_____
Average No. Hours Last Position You Held in Company No. Yrs. on Job

14_____ 15_____
Next to Last Position in Company No. Yrs. on Job

16. Describe your duties carefully and in detail. Give your major duties first; then your special duties; finally mention occasional work. Think your job over carefully. Be certain that none of the major duties have been left out.

(More space allowed for this on form in use)

17. Circle last year of schooling 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
18. List any college degrees or special training you have obtained_____
19. List the three most important duties you perform_____
20. Is your job correctly named?_____ If not what should be your job title?_____
21. Kinds of machines or equipment you operate_____
22. Frequency of interdepartmental contracts:
    Daily_____ Several times a Week___ Weekly___ Monthly___ None _____
23. Quality of interdepartmental contacts:
    Routine matters:_____ Other than routine:_____
24. Frequency of public contact:
    Daily_____ Several times a Week___ Weekly___ Monthly___ None _____
25. Quality of public contact:
    Routine matters:_____ Other than routine:_____
26. Number of employees you supervise:_____
27. Hazards to you from job_____
28. Hazards to others while you are performing your job_____
29. Special knowledge needed for your job_____
30. Previous work experience necessary to successfully carry out the minimum requirements of your job_____
31. Complexity or variety of work you do_____
32. Minimum education necessary to perform job:
    None_____ Grade School___ High School____ College____ Special _____
33. Material or equipment you are directly responsible for_____
34. Working conditions:
    Office___ General Outside___ Dust-Dirt___ Fumes___ Other _____
35. Use the space below for any additional comments you desire to make._____

(More space allowed for this on form in use)

_____
Signature of Employee

EXHIBIT 1

cipal duties and responsibilities. The reverse side of the form is used for the evaluation record. This portion is completed after the job has been evaluated. At the present time we have about 80 job descriptions covering over 300 em-

POSITION ANALYSIS RECORD

(Face of Form)

IOWA POWER AND LIGHT COMPANY Job No: 5430
Position Analysis Record

Grade.

Position Title: Supervisor-Employee Training and Information

Department: Treasury Division: Personnel

Section: Employee Training and Information Date: 2/10/55

Under general direction of Manager of Treasury Department, is responsible for and performs the following duties:

Supervise and assist with the development and administration of company-wide educational, training and information programs.

A. Develop, coordinate and conduct conferences for supervisory personnel.
   1. Employee relations (J. R. T.)
   2. Customer relations
   3. Other group participation program of a similar nature.

B. Develop, coordinate and, when necessary, conduct information programs for employee conferences.
   1. Review of Financial Reports and Operating Results.
   2. Policies and practices.
   3. Other Special releases as approved by Management.

C. Assist supervisors with the preparation of schedules for attendance of employees at meetings.

D. Develop and administer indoctrination program for new employees.
   1. Arrange for and schedule attendance of new employees at meetings.
   2. Coordinate program with supervisory personnel and Personnel Division

2. Review and recommend for release to employees information pamphlets, papers and booklets pertaining to employee training and information program.
   A. Receive and issue such informational data as approved.
   B. Contact publishers of such releases for purposes of obtaining information for selection.
3. Consult with and advise employees on how their questions and problems pertaining to employee relations may be brought to the attention of persons who are responsible for the specific functions about which the employees may have concern.
4. Serve as company representative on training matters at Training Association meetings, with other utility companies and with local firms.
5. Prepare summary reports on the development and advancements made within the training and information programs and make recommendations.
6. Keep abreast of and advise management of the latest trends, developments, and information available on training and information programs.
7. Perform other duties as required.

Position Description Prepared By: J.A. Larson

Approved by Department Head: P.C. Turner

Evaluated: February 24, 1955

(Reverse of Form)

POSITION EVALUATION RECORD

Factor	Degree	Points
Mental Requirements*		
Experience and Training*		

*Other factors are Initiative and Analysis, Working Conditions, Contacts, Responsibility, and Supervision.

EXHIBIT 2

ployees in clerical and semi-technical jobs and about 160 job descriptions covering 250 employees in supervisory and administrative jobs.

These job descriptions were subsequently used by the evaluation committee. This committee was formed of five top executives. Their first task was to select the evaluation factors and to establish the relative importance of each with respect to our particular company. Then, within each factor, they developed various sets of conditions to provide varying degrees of importance. The functioning of the committee in the evaluation process will be described later. After the initial development and installation of the plan, a sub-committee of middle-management supervisors was formed to assist in the evaluations.

Selection of Job Evaluation Factors

Two sets of factors indicative of work called for by the various jobs were developed, one for supervisory and administrative employees and one for clerical employees. This was done for the obvious reason that the relative importance of many factors would be different for two groups. Also, in our description of the factors, we used explanations appropriate to the respective groups. The factors and the relative importance of each factor will vary from company to company but, basically, the factors are quite similar in most cases.

Exhibit 3 contains a pie chart which illustrates the job evaluation factors which were selected and the relative importance attached to each in our case. To the left of the pie chart is indicated the maximum points assigned to each factor. This was done by adding a zero to the per cent value shown and thus producing maximum points totaling 1,000. In order to assist and guide the evaluators, a more detailed definition of each factor was provided, as follows:

1. Experience and training—Total minimum time normally required for an average individual to acquire the practical training and experience required to handle all aspects of the position. This includes essential previous experience in outside or subordinate positions, as well as time in the position under consideration.
2. Mental requirements—Involves the knowledge, judgment and general level of intelligence essential to ensure competent performance in terms of the recorded position content. Mental requirements are often measured by the amount of formal education or the equivalent that an individual must possess for appointment. For the purpose of this evaluation plan, however, no consideration is given to formal education because, too often appraisal of it is misleading. In its place definitive phrases have been used to indicate the varying level of mental requirements.
3. Responsibility—Measures the responsibility attached to a position for making decisions and the extent to which such decisions may be checked by others before damage resulting from errors could be caused, or the effects upon other departments of the company as a result of decisions made.
4. Supervision—Measures both the number of employees and the types of work being done, which are under the direction of the job being considered. It does not necessarily involve the responsibility to hire or discharge.
5. Initiative and analysis—Extent to which resourcefulness, initiative and independent analysis are required. It also indicates the necessity for coping with dif-

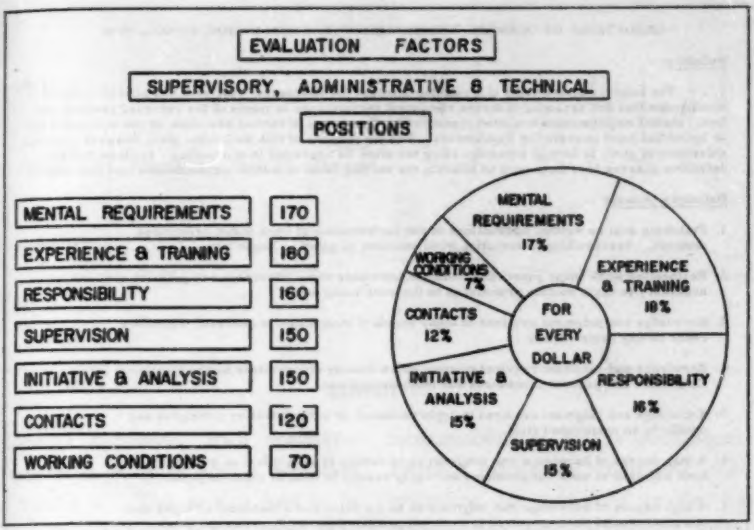


EXHIBIT 3

ations which lie outside customary procedures.

6. Contacts—Measures the quality and frequency of personal contacts required by the job in dealing with associates, customers, and the general public. It includes the effect of such contacts upon the standing and prestige of the company.
7. Working conditions—Considers disagreeableness of working area, physical fatigue, working under pressure, outside work, and personal hazards.

The Evaluation Process

In addition to developing and defining the job evaluation factors, it was necessary to establish various levels within each factor. For example, Exhibit 4 is the write-up of mental requirements for supervisory employees. The brief explanation at the top guides the evaluators, so that each will use the same line of reasoning. Specific definitive phrases are provided in order to assist the evaluators in determining the exact degree to which a factor applies to a position under consideration. A similar write-up is provided for each factor.

After the factors were established, job grades were set up on the basis of points and point spreads were established. Exhibit 5 illustrates the pattern which we use for our supervisory and administrative employees. The total points arrived at in the evaluation process automatically determines the job grade, according to the point bracket in which it falls. The point spreads and number of grades can be adjusted to fit the characteristics of the company.

The first step in the evaluation proc-

GRADATIONS OF MENTAL REQUIREMENTS FACTOR IN JOB EVALUATION

Definition

The mental requirements of a position involves the knowledge, judgment and general level of intelligence that are essential to insure competent performance in terms of the recorded position content. Mental requirements are often measured by the amount of formal education or the equivalent that an individual must possess for appointment. For the purpose of this evaluation plan, however, no consideration is given to formal education since too often its appraisal is misleading. In place thereof, definitive phrases have been used to indicate the varying level of mental requirements that are needed.

Definitive phrases

1. Following oral or written instructions in the performance of work under prescribed methods. Transcribing information when attention to detail is important.	25 points
2. Performing work under prescribed methods but where some knowledge and judgment are necessary to apply routine procedures to the work being done.	50 "
3. Knowledge and judgment required to apply standard instruction to generally repetitive cases having some variety.	75 "
4. Knowledge and judgment required to cope with a variety of conditions in an established field which has general procedures and methods outlined.	100 "
5. Knowledge and judgment required to apply technical or administrative principles and details in an established field.	120 "
6. A high degree of knowledge and judgment as to details of a technical or professional field required to work out problems and apply results to field in which engaged.	
7. A high degree of knowledge and judgment as to the details of a technical or more than one professional field, required to work out problems and apply results to these various fields in which engaged.	170 "

EXHIBIT 4

ess itself, is to find out everything pertinent to the job in question. This is accomplished by a careful review of the job description and supple-

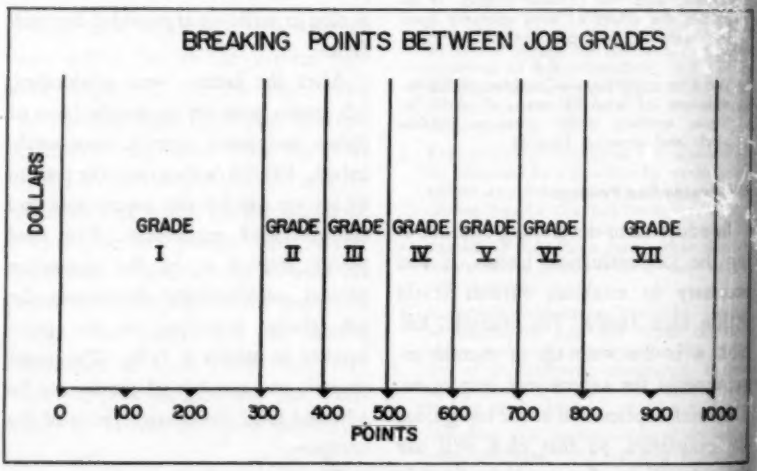
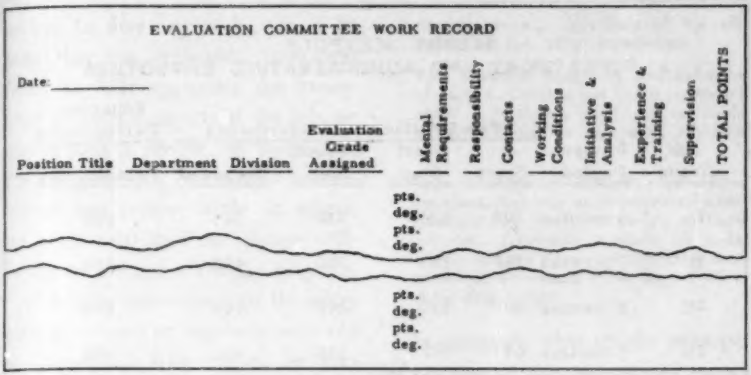


EXHIBIT 5


EVALUATION COMMITTEE WORK RECORD

Date: _____

Position Title	Department	Division	Evaluation Grade Assigned	Mental Requirements	Responsibility	Contacts	Working Conditions	Initiative & Analysis	Experience & Training	Supervision	TOTAL POINTS
				pts. deg.							
				pts. deg.							
				pts. deg.							
				pts. deg.							

EXHIBIT 6

mentary discussion. Each committee member is provided with a worksheet (Exhibit 6). The various jobs to be evaluated are listed and identified as to department and division. To the right are columns for each factor and spaces for the valuation points. Initially, each committee member works independently in assigning points for the various factors. After everyone has finished, the evaluations are compared, factor by factor. Differences are discussed and adjusted until everyone is in agreement. It should be emphasized that the evaluators must exercise extreme care to avoid evaluating the individual rather than the job.

After the points are totaled to determine the grade of the position, the committee takes a "common sense" look at the job and compares it with other jobs in the same grade as well as grades above and below. If the result appears reasonable, the committee can then move on to the next job. The recommendations of the middle-management committee concerned with evaluation are submitted to the top management committee for its review and approval.

Setting the Salary Schedule

All of the work so far narrated was for the purpose of establishing the relative worth of each job in the company. There still remains the job of setting up reasonable salary ranges to cover the grades set up. While the evaluation work was going on, information was being acquired and compiled on comparable jobs in the area. For the supervisory plan, for example, approximately 60 companies were circularized for data on 40 representative jobs. This information provided valuable background in establishing reasonable rates. By plotting it on a scatter diagram, a wage curve was calculated which represented the standard rate for comparable jobs in the area. We

SALARY SCHEDULE
SUPERVISORY AND ADMINISTRATIVE EMPLOYEES

Job Grade	Review Period	For Satisfactory Performance				Superior Performance
		Start	First Step	Second Step	Standard	Maximum
I	6 months	300	315	330	345	400
II	7 months	350	365	380	400	450
III	8 months	400	420	440	460	525
IV	9 months	475	495	515	535	600
V	10 months	550	575	600	625	700
VI	11 months	625	665	705	750	825
VII	12 months	700	750	800	850	1000

EXHIBIT 7

pegged our maximum rate about 15 per cent above this line and our minimum rate about 15 per cent below.

A salary schedule which illustrates the establishment of wage rates for each job grade in the supervisory plan appears in Exhibit 7. This is merely an example and is not the salary schedule for our company. Note that shorter intervals for review are provided for the lower echelons of employees, along with correspondingly smaller salary increases. Generally, an employee is hired in the satisfactory performance range which is between "start" and "standard." Usually, he can expect to progress to the standard in the pattern set forth here. After a man has reached the standard rate for his job, it requires superior performance to progress further. Also, after he reaches standard, the regular review period for all grades is one year.

It should be emphasized that this schedule is a guide only and that individual supervisors control the rate of progression. Increases can be denied, delayed, or reduced, depending on the performance of the individual. The range in each grade gives the supervisor considerable latitude in administering the plan. Once the position has been evaluated and placed in a job grade, it is up to the supervisor to determine how the incumbent should be paid. On or about the review date set in the schedule each supervisor is required to visit with the employee.

Anytime a supervisor feels a job has changed sufficiently to warrant a

review, he may request it. Or, if he feels that the evaluation committee failed to fully appreciate the importance of certain aspects of the job, he may request a review. In some cases the job grade may be changed as a result of this review, while, in others, the point total may not change sufficiently to warrant a change in grade.

Aside from individual jobs, the salary schedule should be regularly reviewed and appraised with respect to area wage rates, cost of living, regional economic conditions, labor market, and so on. Revisions to the salary schedule are generally on a percentage basis applied to all grades, in order to maintain the proper relationship.

Reasons for Failures and Signs of Success

This paper would not be complete without mentioning some of the primary reasons for failure to achieve the maximum benefits of job evaluation program, when this is the case:

1. Lack of "selling" by management. Without management's support, the most perfect plan cannot produce satisfactory results.
2. Inadequate data for sound evaluation. There is no short-cut to sound evaluation. All pertinent data must be obtained and appraised.
3. Laxity in administration after installation. Effective wage administration is a continuous process, regardless of the efficiency of the initial installation.
4. Poor selection, weighting, and definition of factors. Carelessness in this matter will result in inequities which will eventually defeat the plan or reduce its effectiveness.
5. Poor selection of evaluation committee members, not only as to individual qualifications but also as to variety of backgrounds. Obviously it would be undesirable to have the entire committee composed of individuals in the same field or same department.

In summary, what are the principal advantages of this program as we see them. First of all, the majority of our employees appear to be well satisfied with it. Second, supervisors are able to administer wage and salary matters equitably. Third, we have a means of making adjustments due to growth, job changes, and reorganizations. Fourth, and perhaps most significant, our employee turnover has been reduced and we have been more successful in filling vacancies with competent replacements. As a final word, it should be re-emphasized that a job evaluation program has to be tailored for each company, because of widespread differences in situations. The initial development is a sizable project but, after that point, it is relatively easy to keep abreast of changes. The degree of success is limited only by the time, effort and enthusiasm put into the program.

Letters to the Editor

AN EXAMPLE OF TELEGRAPHIC TRANSMISSION OF FINANCIAL DATA

Editor, N.A.C.A. Bulletin:

WITH THE DECENTRALIZATION of General Electric Company, starting in 1951, the consolidation of financial information became much more difficult and complex than it had been. Analysts had to spend too much time on the clerical work of consolidation and not enough time was available for analyzing the results.

A procedures study indicated that substantial time savings could be realized by transmitting financial data by telegraph to the home office in Schenectady and performing the consolidation there on punch card equipment. It also indicated that the Company's network of leased telegraph lines was adequate to handle the data being transmitted and that the punch card machine room would be able to handle the additional load resulting from the consolidation work. Additional special equipment required consisted of three 5 channel punch-paper-tape perforators for the receipt of telegraphic information in the punch card machine room and two tape-to-card converters, permitting the tapes received to be converted to 80-column punch cards.

Immediately upon closing the books each month, each of the company's more than one hundred operating locations prepare a summary of operations, a balance sheet, a statement of inventory details and miscellaneous data plus a number of special reports for transmission to Schenectady. These are prepared on special forms which contain all the instructions needed by the telegraph operator in transmitting the information. Each line of the form is numbered, the line number corresponding to accounts so that the data may later be sorted in account sequence. Current month information and year to date totals are transmitted together with percentages showing variance of each item from budget. Each space for a number or per cent is identified with a code indicating whether it is a debit or credit. In transmitting, the telegraph operator transmits horizontaliy across the form beginning with line number 01 transmitting each number in sequence including all zeros and completing the line with the symbols "CR, LF" which stands for carriage return and line feed, proceeding to line 02 and so on down the page. All dollar amounts are transmitted as six digits and all percentages as three digits. This is achieved by adding zeros to the left of the last significant figure until there is the proper number of digits. As a result, each horizontal line transmitted must consist of exactly 24 digits.

As tapes are received in the home office, they are immediately converted to 80-column tabulating cards by passing them through the tape-to-card machine. If any line consists of other than 24 digits, the programming of the tape-to-card machine will cause it to stop and indicate that an error has been detected. The incorrect data may then be corrected before being converted into punched cards.

The tape-to-card machine is programmed in such a way that each line of the statement being transmitted is converted to a separate tabulating card. At the same time, a five-digit organization code is automatically reproduced into the card. This code identifies the department transmitting as well as the division and group of which the department is a part. As each department completes its transmission, cards

produced are tabulated for balancing purposes. A total for each column of data is also transmitted but with sign reversed. When tabulated, this should result in a zero balance for each column. Each balancing tabulation is visually scanned for items out of balance, and whenever an out of balance item is discovered, the reporting unit is called by telephone and correcting information obtained. Correcting cards are then manually keypunched and inserted in place of the incorrect card or cards. Very few corrections are necessary, and these do not delay the issuance of reports.

When all reporting departments have transmitted their information and the cards have been balanced through the media of the balancing tabulations, the cards are sorted by the two-digit line code number. This has the effect of bringing all of the cards together in statement order by account. The cards are then listed with totals being shown for each account by department, group and total company. Group and total company reports are prepared manually, inasmuch as the volume does not warrant further applications of machines and tabulated figures are available from the preceeding machine step. Individual department reports are prepared by machine, using the same cards but printing the reports on continuous offset plates.

The principal benefit gained through the mechanization of the General Electric consolidation of financial data has been the transfer of most of the clerical type operations from individuals to machines. This has freed the individuals who would otherwise be performing the clerical operations to spend their time in analyzing and interpreting financial results. We feel that this benefit is even more important than the time-saving effected. In the future, we expect to further improve our consolidation routine through electronics.

J. E. VAVASOUR

Notes on Current Reading

Books

How Foremen Can Control Costs

Phil Carroll, McGraw-Hill Book Co., 330 W. 42nd St., New York 36, N. Y., 1955, 301 pp., $4.00.

Addressed to foremen—not just about them—this volume is written simply and sometimes in vernacular. One chapter title "How Come My Scrap Is Up?" with the subtitle "Cost Men Don't Know How to Figure" is illustrative of all twenty-four. The book is pocket size and the diagrams and cartoons (Yes!) are in proportionately small size so that they may be noted in the process of reading the text rather than referred to as a separate and distracting requirement of understanding the book as a whole.

Audit of Your Business Insurance

Research Institute of America, 589 Fifth Ave., New York 17, N. Y., 1955. 16 pp. & 7 exhibits.

Subtitled "A Simple Method to Assure the Right Coverage, The Right Amount, At Lowest Cost," this study asserts on its opening page that "many companies are carrying the wrong kinds of insurance or the wrong amounts—or believe they have protection which their policies do not acually provide." The remainder or the study is devoted to "trouble-shooting" this situation. Its final section tackles "Controlling Insurance Costs."

Modern Plant Maintenance Practices

Factory Management and Maintenance, McGraw-Hill Publications, 330 W. 42nd St., New York 36, N. Y., 1955, 128 pp., $.50.

There is both technical and control information in this manual of ways and means to handle maintenance. Costing and incentives in this area are dealt with both under the heading of "Maintenance Management Practices" and "Maintenance Work Measurement." Technical detail appears throughout and especially in such sections as those for "Lubrication," "Air Conditioning," etc.

Marginal-Cost Price-Output Control. A Critical History and Restatement of the Theory

Burnham Putnam Beckworth, Columbia University Press, 2960 Broadway, New York 27, N. Y., May 1955, 283 pp., $3.75.

Within the province of economics and certainly without direct bearing on accounting, this book is, nevertheless, one of which accountants may desire to be aware. It deals critically with a theory which has been stated "that output should be increased or decreased until price equals marginal cost." It is partly historical in its tracing of thought on the subject.

Bibliography of Internal Auditing

The Institute of Internal Auditors, 120 Wall St., New York, N. Y., 1956, 107 pp., $2.00.

Revised and brought up to date by this bibliography is one issued in 1951. The present edition is presented as a "complete reference index of all material on internal auditing . . . through December 1955." It is a merged listing alphabetical by topics (with entries alphabetical by author) and alphabetical by author (with entries alphabetical by title). The listings under "Machine Accounting" and "Sampling" are illustrative of those of general interest.

Credits and Collections in Theory and Practice

Theodore N. Beckman and Robert Bartels, McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N. Y., Sixth Edition, 1955, 612 pp., $6.50.

The area of credit has only certain points of contact with cost accounting and not many more with financial accounting, al-

SELECTED ARTICLES FROM ACCOUNTING PERIODICALS

THE CONTROLLER, *May* 1956 (2 Park Avenue, New York 16, N. Y., single copy $.50)

Cost of Capital. A Report Prepared by the Finance Management Committee. New York City Control. Controllers Institute of America.

Deciding Upon an Electronic Data-Processing System. Wesley S. Bagby.

THE CONTROLLER, *June* 1956.

The "Anti-Chance Factor" in Business. Joseph J. Schofield.

Financial Public Relations and the Controller. Harold M. Garthlye.

Corporations Subjected to the Accumulated Earnings Tax. Robert S. Holzman.

An Executive Development Program for the Controller. Gerald L. Phillippe.

COST AND MANAGEMENT, *May* 1956 (31 Walnut St. So., Hamilton, Ontario, Canada, single copy $.50)

Co-ordination of Plant Operations and Comptroller's Department—From a Works Manager's Viewpoint. R. J. Woxman.

The Industry-Wide Approach to Financial and Operating Ratios. C. B. Taylor.

The Guaranteed Annual Wage. H. C. Pentland.

THE INTERNAL AUDITOR, *June* 1956 (120 Wall Street, New York 5, N. Y. Single copy $1.00)

The Impact of Electronics on Punched Card Accounting. W. P. Livingston.

Internal Audit of Transportation Procedure and Expenditure. George A. Jacob.

Planning and Control for Internal Operation. C. Harold Southard.

JOURNAL OF ACCOUNTANCY, *June* 1956 (270 Madison Avenue, New York 16, N. Y., single copy $.75)

Cost Justification for the FTC. Herbert F. Taggart.

Accelerated Depreciation for Tax Purposes. (Editorial)

THE NEW YORK CERTIFIED PUBLIC ACCOUNTANT, *June* 1956 (677 Fifth Avenue, New York 22, N. Y., single copy $.50)

Leased vs. Purchased Transportation Equipment—Tax Considerations. Milton D. Safane.

Leased vs. Purchased Transportation Equipment—Cost Considerations. Robert G. Conroy.

Price Adjustments Resulting from Changes in Government Contracts. Paul M. Trueger.

though statement analysis is of importance to credit men and is treated in this book. Nevertheless, the credit function is a part of industrial operation and, as such, is a cost area of some prominence, and one which is tied to revenue realization.

Articles

Cost Studies In Automation

John L. Marley, American Business, May 1956.

Featuring this article is a table of figures for five companies of graduated size with respect to tabulating equipment costs, classified into card origination, processing, and output costs. The article centers on comparison of these costs with those which will be incurred with electronic equipment.

SELECTED ARTICLES FROM BUSINESS PERIODICALS

THE OFFICE, *June* 1956 (232 Madison Avenue, New York 16, N. Y., single copy $.35)

How to Reduce Your Clerical Costs. Fred E. Shelton, Jr.

A Low Cost System of Industrial Accounting. Fred C. Ward.

OFFICE EXECUTIVE, *June* 1956 (132 West Chelton Avenue, Philadelphia 44, Pa., single copy $.50)

Automation's Impact Upon Job Evaluations. Richard E. Sullivan.

Wanted! Cost Reduction. Fred E. Shelton, Jr.

Accounting as a Prophet of Profits. Albert E. Lankford.

Computers and Accounting Systems, A Bibliography

Robert H. Gregory, Accounting Review, April 1956.

The bibliography here offered is divided into three section relating to (1) design and construction of equipment (2) "system investigation and equipment application" and (3) systems analysis and revision. Both books and articles are included in each section. The listings run more than five pages and are taken from a more comprehensive bibliography of 1,000 items prepared for a "management information systems" course at Massachusetts Institute of Technology.

Accounting for Productivity Changes

Harry Ernst, Harvard Business Review, May-June 1956.

The first word in the title of this article is a very familiar one but the nature of the text suggests that it has uses with which accountants are not particularly familiar. A productivity measurement article, the presentation suggests use of industry as well as company data (but not "national averages") and much mathematics to apply them. Nevertheless, it *is* an accounting article and "offers a new system of productivity accounting to enable the management of a plant to determine how much labor is contributing to changes . . . compared with other factors."

The Manager's Span of Control

Lyndall F. Urwick, Harvard Business Review, May-June 1956.

Here is an article on organization relevant to the question of how far to centralize or decentralize management. How many subordinates should have direct access to a common superior in discharge of his overall responsibility? Through how many levels of authority should a matter be allowed to pass before it reaches authority to dispose of it? Answers to these questions may be at variance. The present article deals principally with minimizing the figures used as an answer to the first but it does not ignore the second.

For Your Information

A TEXT ON ELECTRONIC COMPUTERS

LAST MONTH this group of paragraphs was devoted to a type of review or, more properly, contents description, of one of the recent volumes on the electronic equipment which has made electronic data processing possible by introducing automation to the office. In consideration of the current importance of the topic, the stress on it in articles in both the July and August issues of the *N.A.C.A. Bulletin*, and in consideration also of its possible place in members' summer reading, these paragraphs likewise are devoted to a recently published book in the same area. This book is *Electronic Computers and Management Control* by George Kozmetsky and Paul Kircher, also published this spring, issued by McGraw-Hill Book Co., 330 W. 42nd St., New York 16, N. Y. ($5). It is a 12-chapter 250-page work, plus appendices which reserve for separate attack material which might impede the text.

General Contents

As with other presentations of developments in this field which brings the industrial accountant (and others) face to face with an assembly of problems he would rather meet one at a time, the authors have tried to soften, simplify and yet make significant the chapter titles which, via the contents page, offer the reader his initial indication, aside from the preliminaries of jacket and preface, as to what he will find in the body of the book. The authors succeed in making the chapter titles tempting but they cannot hide (and probably do not want to) that the reader is up against at least something.

"Why be interested in computers?" and "What is an electronic computer?" inquire the first two chapters and the next three "survey electronic methods of data processing" report "studies and applications of electronic systems," and identify "administrative problems." Intermediate chapters relate "management and the scientific approach," and undertake to explain "programming, scheduling and feedback." The territory of application which the final group of chapter titles suggest is broad indeed, covering "integrated business systems," "automatic and scientific computation," "role of the executive in (system) selection" and the "challenge to the executive." The information saved for the four appendices (preceded by a six-page bibliography) describes binary counting which is the "language of the computer," explains and exemplifies programming, identifies makes and models of computers, and illustrates "a mathematical model for integrated data systems."

The Reader's Company Background

The text is in general language for the general reader. It is he, more specially if he is a business executive, whom the authors are addressing. A minimum of tables and charts accompany the text. The way is clear for the reader to traverse at will the twenty-page chapters and ten-page appendices. Despite all this readiness, we may need a little more encouragement. We fear a series of small blank walls when we approach this subject. We are loathe to believe that we can attain an integrated understanding of it. Again, we may resort to the index test to soften up the text for us. It will do that. When we have read into the book in this way, tracing references and reading passages, we will at the same time grow familiar with the manner of writing employed. But, at some point, if we are to

get what we want, the book must be given a proper reading.

Still, it will be a better reading if the industrial accountant approaches the topic with the full knowledge that he has his own starting points. There is a double thought here. First, you cannot integrate processing of data unless you go back to where it originates—anything less fundamental sets up a point of dis-integration in the processing. (There may be such of necessity but it is counter to intention of the concept.) Second, every accountant in every company is in a position to hold in mind a concrete data processing situation—and to keep his approach to the whole subject much more managable—if he thinks back to the origins of data in his own company. Among such data are: the hiring transaction, its details, the commitment involved and the payroll and cost data related to it; the purchase transaction and resulting liability, cash, and cost effects; the sales order and the consequent manufacturing, shipping, billing, collecting, income recording and other events set in motion by it; and the considerable number of other types of transactions in a business enterprise.

If, before reading a discussion of integrated data processing such as that by Messrs. Kozmetsky and Kircher, an industrial accountant will think out the origins and processing sequences of data in his company, he will have a ready-made means of clarifying for his own use and visualizing the application of the considerations advanced in text. He will attend to the author's illustrations and, before he is through, he will have his own in a more or less complete mental projection.

A Sample of the Presentation

A specific look at the present book is now in order, specific in the sense that, in contrast with the description of scope and material arrangement already indicated, it should, if this is possible here, convey a taste of the reading quality of the work, i.e., what the reader will encounter. Before this is attempted in the extremely limited way in which it must be done here—by a single excerpt—the comment should be made that the authors go beyond integrated data processing at certain points to the field of mathematical unscrambling of management alternatives of great complexity, i.e., operations research, for which electronic equipment is the tool. Business will doubtless have need for this and accountants will want a better understanding of it. On the other hand, now, the question of the practicability of installing electronic equipment as a substitute, improvement, and enlargement in known areas of business information is foremost.

Of this nature is the chapter entitled, "Integrated Business Systems" from which the illustrative quotation here given, (pages 185-6) is taken:

"Too often the approach taken at present is to create a data-processing system which meets only the inescapable needs, such as for billing of customers, preparation of tax returns, and for publishing annual reports. To this may be added some kind of cost system, in many cases operated by an entirely separate division of the controller's department. Then, in progressive firms, a further modification may be introduced by the creation of staff analysis groups, empowered to gather and present statistics for special studies. Each operating department creates its own requirements and may build up its own data system.

"Even though they have a 'whole system concept' as the basis for their work, systems groups have found it advisable to begin their integrated studies by working on fairly independent segments of the overall system. They start by attempting to solve the needs of all the interested end-users of the data in a particular area of operations.

"In so doing, there is always a danger that practice and theory will differ. If the installation is to keep from too narrow an approach, some method must be found to remind the individual analysts of the overall objectives of their work.

"In general, the following considerations are typical of those to be remembered:

1. Management's need for planning and control information.
   a. Different type of information for different managerial levels (condensed versus detailed data, charts versus figures, extent of written explanations, etc.)
   b. Different frequency of reporting for different purposes.
   c. Different form of analysis for different purposes (exceptions, variances, trends, etc.)
   d. Availability of stored information, to answer special inquiries for analysis to prepare special reports, etc.
2. Routine operating needs.
   a. Daily and periodic accounting requirements, for billing, inventory, cost accounting, payroll, payables, cash receipts and disbursements, etc.
   b. Production requirements for scheduling, requisitions, orders, etc.
   c. Personnel information for manpower assignments, turnover, etc.
   d. Stockholder information.
   e. Sales and market information.
   f. Capital asset control.
3. Requirements for internal audit.
4. Legal and tax requirements.
5. Requirements for external audit.
6. Requirements for published reports.
7. Data for trade association and government agency requests."

Trusting One's Own Powers of Understanding

What has happened when a book has been read through on such a topic as integrated data processing? It is not likely that a new expert on the subject has come into being. It is not even likely that all blind spots have been cleared up for the reader. Probably the reading process will not place him in complete readiness to recommend an installation or particular equipment for his company. Some areas of understanding, say, of the scanning of data or programming of computations, which perhaps grew relatively clear as reading progressed, will appear to have become obscure again as perusal of the middle part of the text overlays the first part and is, in turn, partly overlaid by the last. What, then, is the use of undertaking as a project, the reading of a text intended to impart clear and well-proportioned comprehension of a topic.

The use simply is that knowledge does come, in part or whole, in response to the endeavour to understand. A man's mind is more intelligent than he knows, be he ever so vain a person. It will not fail to relate what he reads to his past experience and his present situation any more than the stomach will refuse to digest food. But what he reads will have more use to the mind in these faithful responses if it contains material relevant to experience and situation. That is the advantage of the coverage of either textbook or other reading matter which has as a particular objective to leave no major point untouched and to offer information with a maximum of clarity.

The reader, of course, is practical. He does not want to waste time on generalities or in blind alleys or on theoretical considerations. He wants to employ his reading time on integrated data processing in the direction of helping his company make the most serviceable application of electronic equipment—neither too much nor too little—and to help solve the question of whether the cost is worth the benefit. Well, it can be said confidently that the two books which have been considered on these pages, one last month and one this—and several others like them—are also highly practical in their objectives because they have been written for the needs of the present and reflect the current situation. It seems highly likely that the reading time required to traverse the pages of one such volume would be a fruitful investment.

NATIONAL ASSOCIATION OF COST ACCOUNTANTS
NACA
1919